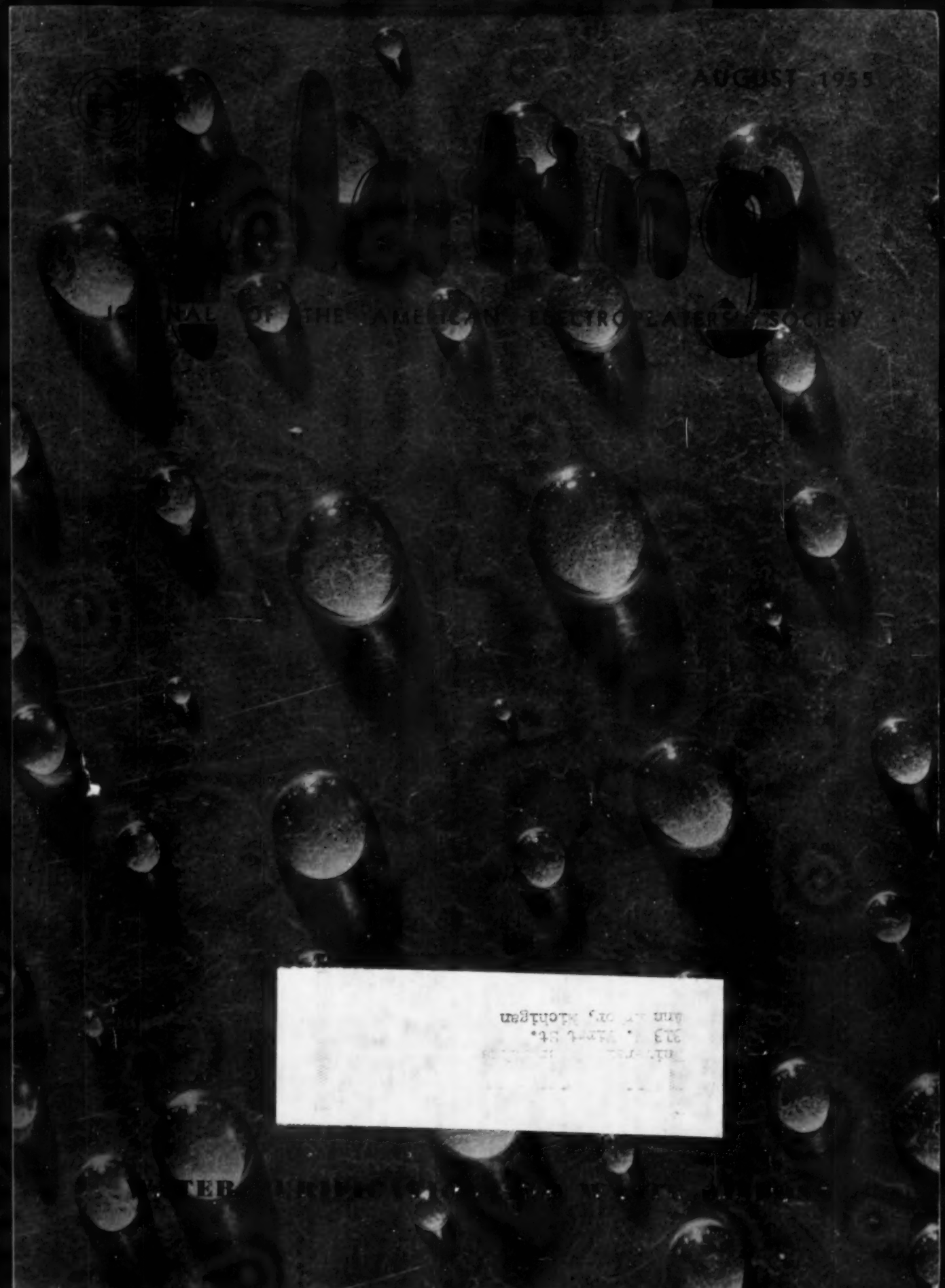
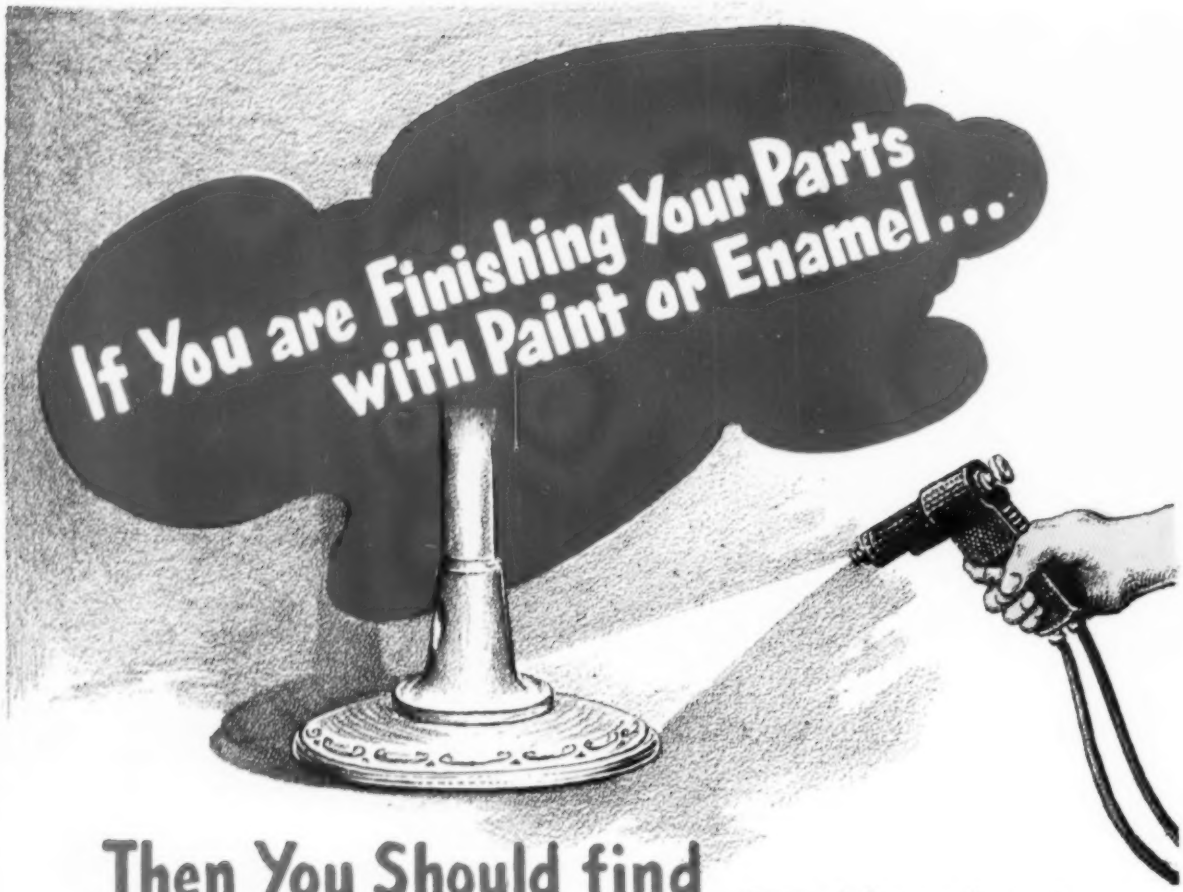

AUGUST 1955



Then You Should find

Some of these products of great help to you in your production work. These materials have been developed to increase your efficiency and all have been in regular production work for years.

We suggest for your consideration . . .

For Conversion coatings on steel ..... CLEPO-PHOS-196-F.
For Waterfall Spray booth cleaning ..... CLEPO-58-E.
For Stripping paint and enamel from steel ..... CLEPO-5-R.
For Soak cleaning of steel, zinc base, etc. ..... CLEPO-136-R.
For spray washing machine cleaning . . .

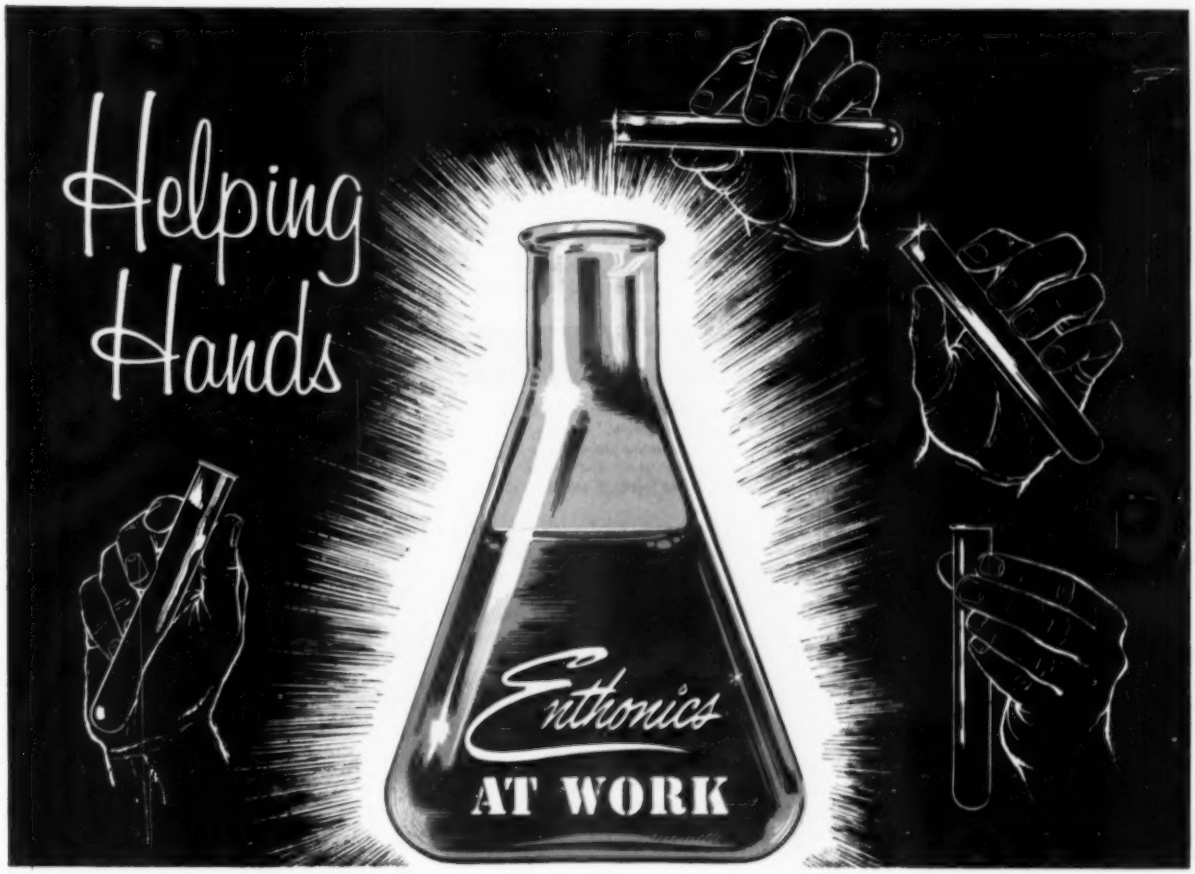
CLEPO-126 a heavy duty cleaner for steel.
CLEPO-131-W a milder cleaner for Brass, steel, etc.
CLEPO-85-AN a mild but powerful cleaner for all metals.

Your Clepo Service man will be glad to demonstrate these materials at your convenience.

FREDERICK **GUMM** *Chemical Company, Inc.*

538 FOREST STREET, KEARNY, N. J.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 800.



FROM THOUSANDS of TESTS . . .

. . . *come the solutions to your metal finishing problems.*

If *you* are looking for creative chemistry to supply new methods for the improvement of metal finishing, look to the leader – ENTHONE. Write for the answers to these problems, identifying them by number. If your specific problem is not listed, Enthone will gladly help to find the answer.

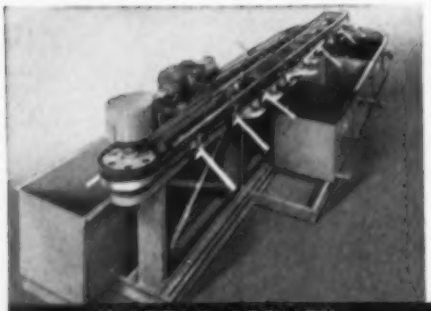
1. HOW TO BLACKEN copper, brass, zinc, steel and other metals to meet U.S. Government specifications.
2. HOW TO STRIP NICKEL from steel without etching the steel.
3. HOW TO STRIP NICKEL from copper and brass without attacking the part.
4. HOW TO SHED WATER from metals to prevent staining or spotting during drying.
5. HOW TO TRAP FUMES from hot sulfuric acid pickles.
6. HOW TO STRIP SYNTHETIC ENAMELS from aluminum and other metals without attacking the metal.
7. HOW TO CLEAN AND REMOVE RUST AND OXIDES from steel in one operation without acids.
8. HOW TO RINSE AND DRY STEEL WITHOUT RUSTING, using cold or hot water.
9. HOW TO SHORTEN ALKALI CLEANING TIME for steel to 15 seconds.
10. HOW TO REMOVE SOLID DIRT AND OIL from metals.
11. HOW TO STRIP LEAD, TIN or soft solder from copper and brass with no etching.
12. HOW TO PLATE METALS upon aluminum.
13. HOW TO REMOVE EXCESS SILVER SOLDER chemically from silver brazed steel parts.
14. HOW TO MAKE PAINT STICK to brass and zinc.
15. HOW TO SOLVENT-CLEAN parts and assemblies with cold non-hazardous solvent.
16. HOW TO OVERCOME CHROMIC ACID CONTAMINATION in cleaners.
17. HOW TO PREVENT STAINING of chromium plate.
18. HOW TO GIVE ZINC AND CADMIUM high salt spray resistance.
19. HOW TO COLOR ALUMINUM in one operation.
20. HOW TO STRIP METAL COATINGS from zinc die castings.

** The Scientific Solution of Metal Finishing Problems.*

ENTHONE
INCORPORATED

METAL FINISHING PROCESSES
442 ELM STREET, NEW HAVEN 11, CONNECTICUT
ELECTROPLATING CHEMICALS

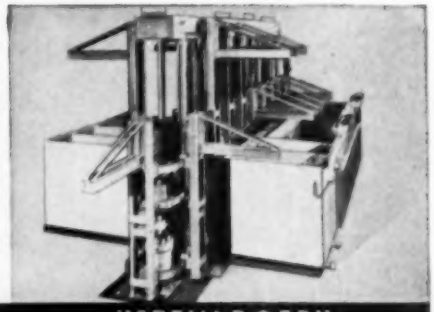
Service Representatives and Stock Points in Principal Cities of U.S.A. and Canada, Mexico, Brazil, England, France, Sweden and Germany.



"LITTLE STEVE"
Rack Type Machine

Low initial and low operating costs are features of this newly introduced small automatic which has a big capacity for its size.

Unit's load capacity, mechanical flexibility and lift design meet tomorrow's increased safety and production requirements.

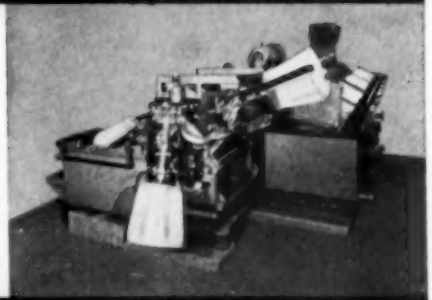


"STEVADOER"
Rack Type Machine

MODEL "A"
Rack Type Machine

A compact automatic processing machine, embodying the famous Stevens auxiliary cam shaft and lifters for rapid vertical transfer.

A proven automatic barrel machine for plating and processing small parts. Only unit with fully automatic load and unload features.

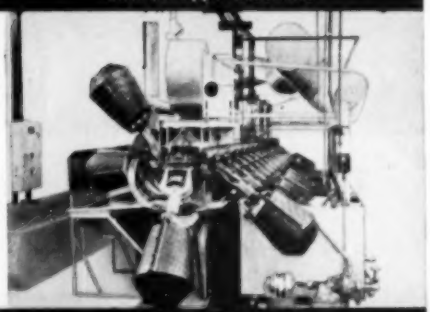


MODEL "C"
Barrel Type Machine

MODEL "B"
Rack Type Machine

Features rapid, continuous movement processing employing hump type cams. Design permits utmost mechanical and cycle flexibility.

Large capacity automatic barrel unit for volume production. Embodies major features of the famous Stevens Model "C" machine.



"SUPER E"
Barrel Type Machine

AN AUTOMATIC MACHINE FOR EVERY METAL FINISHING NEED

The Stevens family is now complete. Six Stevens automatic plating and processing machines fill every need for metal finishing.

• Latest addition to the complete line of Stevens automatic metal finishing machines is "Little Steve." Announcement of the new "Little Steve" follows by a few months the recent introduction of Stevens heavy-duty "Steveadoer" Processing machine.

Now you can go automatic in any and all of your plating operations. Stevens can furnish a job-engineered, cost-cutting, fully automatic machine that will answer every production need whether it be for electroplating, cleaning, anodizing, bright dipping. You will get better control, better finishes and eliminate rejects with Stevens Automatics.

Why not see how one of Stevens great family of automatics can be engineered for your metal finishing operations? Call in a Stevens Sales Engineer today or write direct to—

BRANCHES: BUFFALO • CLEVELAND • INDIANAPOLIS • NEW HAVEN

FOUNDRY FACINGS | GRINDING OPERATIONS | BLAST FINISHING | BARREL TUMBLING | METAL CLEANING | POLISHING & BUFFING | AUTOMATIC FINISHING | AUTOMATIC PLATING | METAL RECLAMATION

FREDERIC B. STEVENS
INCORPORATED
YOUR METAL FINISHING SUPERMARKET
DETROIT 16, MICHIGAN

Metal Finishing equipment and supplies from castings or stampings to finished product.

An Educational Society for the Advancement of the Science of Electroplating, the Finishing of Metals and Allied Arts

plating

Journal of the American Electroplaters' Society

August 1955 **Vol. 42, No. 8**

P. Peter Kovatis

Executive Secretary and Managing Editor

Archimedes Doria

Editor

A. Brenner, J. B. Capuano, P. Coady, L. Diveley, F. Fulforth, R. Harr, A. Logozzo, H. McAleer, R. D. Miller, L. F. Scott, W. Tucker, H. Wiesner

Editorial Board

James C. Adams

Production Manager

H. George Burnley

Advertising Manager

Robert F. Buehler

Assistant Advertising Manager

Lee F. O'Connell
111 N. LaCienega Blvd., Beverly Hills, Calif., CRestview 5-2022

William Ayres
Lee F. O'Connell Co.
233 Sansome St., San Francisco 4, Calif. YUkon 6-2981

Western Advertising Representatives

Published by the American Electroplaters' Society, Incorporated, 445 Broad Street, Newark 2, N. J. Phone: HUmboldt 2-3400. Yearly subscription for Members $2.00. Nonmembers U. S. and Canada $5.00, 65c a copy. Foreign, $8.00 a year, $1.00 a copy.

Copyright, 1955, by the American Electroplaters' Society, Incorporated.

PLATING is abstracted regularly in Chemical Abstracts, Metals Review, Metallurgical Abstracts, Engineering Index, Technical Data Digest, and Bulletin Analytique.

Statements of fact and of opinion given in articles and papers in PLATING are those of the contributors. The American Electroplaters' Society assumes no responsibility for them.

Articles appearing in this publication may not be reproduced in full or in part without express permission of the Managing Editor.

Published monthly at 5800 N. Marvine St., Philadelphia 41, Pa. Entered as second class matter July 1, 1946, at the Post Office at Philadelphia, Pa., under Act of August 24, 1916

Editorial *Clyde Kelly* 935

Recovery of Plating Wastes. *L. Weisberg and E. J. Quinlan* 1006

Rinse Water Re-Use by Ion Exchange. *C. Buelman and A. B. Mindler* 1012

Practical Methods for Treatment of Metal Finishing Wastes. *J. C. Hesler* 1019

Solids-Liquid Separation in the Treatment of Metal Finishing Wastes. *R. F. Ledford* 1030

AES Research Project No. 15: Progress Report on Accelerated Corrosion Tests for the Performance of Plated Coatings. *W. L. Pinner* 1039

Water Purification with Activated Carbon. *W. A. Helbig* 1044

Convention Echoes 1046

AES Directory 1062
AES Membership Report 1060
AES News 1055
Article References 992
Books 1000
Branch News 1059
Classified Advertisements 1057
Cover Story 938
Equipment and Supplies 974
Future Meetings 1070
Industry News 940
Intersociety News 1051
Mail Box 996
Patent Abstracts 988
Personals 948
Trade Literature 957
Index to Advertisers 1069

HARSHAW

Cadmium Fluoborate
Lead Fluoborate
Copper Fluoborate
Tin Fluoborate
Nickel Fluoborate
Fluoboric Acid

Harshaw Fluoborate Plating Chemicals

Select the nearest Harshaw Branch...

CHICAGO 32, 4925 South California Avenue
CINCINNATI 13, 6265 Wiehe Road
CLEVELAND 6, 1945 East 97th Street
DETROIT 28, 9240 Hubbell Avenue
HASTINGS-ON-HUDSON 6, N. Y.
HOUSTON 11, 6622 Supply Row
LOS ANGELES 22, 3237 South Garfield Avenue
PHILADELPHIA 48, Jackson and Swanson Streets
PITTSBURGH 22, 505 Bessemer Building
6th Street & Fort Duquesne Blvd.

THE HARSHAW CHEMICAL CO.
1945 East 97th Street, Cleveland 6, Ohio
BRANCHES IN PRINCIPAL CITIES

Editorial

THE FUTURE OF THE AES

IN contemplating the future, we know that the success of our Society depends on the energy and the initiative with which each of us as a member or an officer faces and masters the problems confronting us.

One of the problems with which we are concerned is the lack of growth of the Society. Certainly we do not seek size alone, numerically speaking, but new members coupled with the introduction of new ideas will keep us abreast of the times. (Parenthetically speaking, this does not exempt old members from bringing forth new methods—and sharing them through meetings and our publications.)

The Educational Committee, consisting of branch librarians with the First Vice-President of the Society acting as Chairman, plans to exchange information throughout the coming year. This innovation should result in more fruitful meetings than heretofore.

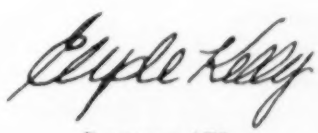
Constructive suggestions are much needed by the Editorial Board. If you have even a small suggestion but lack the time to dress it up, just send in the bare outline. The Board will do the rest. As you know, the Editorial Board is responsible for securing papers for PLATING and for the conventions.

In this connection the Research Program, one of the Society's most important activities, also merits your support (financially as well). This department has spent much time dealing with that old problem, "Disposal of Plating Room Wastes"—and the current issue of PLATING includes material on this subject.

Our Annual Conventions give us the opportunity to exhibit our plated work and to pass on our "know-how" to those interested. Likewise, the Industrial Finishing Exposition gives the manufacturers the opportunity to present the latest in equipment and processes.

When buying equipment and supplies, let reciprocity be the keynote. It's naturally just good business to buy from those who advertise in PLATING.

The foregoing lists just some of the avenues by which the AES serves you and by which you, in turn, may serve it so that both may grow and prosper.



PRESIDENT, AES

For Rapid Barrel Finishing

EXOLON

Tumbling Abrasive

Various stamped, die cast, forged and screw machine parts before and after barrel finishing with EXOLON abrasives.

• More and more manufacturers are turning to barrel finishing for its big savings and uniformity over individual hand finishing.

Naturally, the process is only as effective as the abrasive used. In response to the demand for a fast-cutting, long-life abrasive, EXOLON has developed this superhard aluminum oxide grain which is *barrel-finished itself* for non-scratch, precision smoothing of your metal surfaces.

May we barrel-finish some of your sample parts *at no obligation to you?* Or, if you prefer, we are prepared to furnish you trial lots of Exolon Barrel Finishing Abrasive at quantity discount for trial in your own barrel. You will find, as others are finding daily, that it gives you a superior finish at substantially lower cost. Write today!

SINGLE OPERATION ECONOMY

★ **IN CLEANING UP**
★ **IN REMOVING BURRS**
★ **IN REMOVING SCALE**

from:

- forgings
- metal castings
- metal stampings
- machined parts

which can be handled in the barrel.

WRITE TODAY FOR DETAILS including our new fact-filled catalog.

The EXOLON Company

973 East Niagara Street **Tonawanda, N. Y.**

Thorold, Ontario, Canada

***Manufacturers of* SILICON CARBIDE *and* ALUMINUM OXIDE ABRASIVES**

CHECK LIST your Bright Nickel Plating Bath Should Match!

- Is it economical to operate?
- Does it produce bright, ductile, active deposits which readily accept chrome?
- Has it excellent bright throwing power?
- Can it be easily controlled through "on the job" testing procedures?
- Is it extremely tolerant to both organic and inorganic impurities?
- Are addition agents in "easy to add" liquid form?
- Does it require infrequent purification treatments?
- Can it be used over wide ranges of solution composition and operating conditions?

McGEAN

Because McGean Bright Nickel meets all these requirements . . . *it has long been established as the industry leader!*

For full information . . . contact . . .

THE McGEAN CHEMICAL COMPANY

Cleveland 15, Ohio

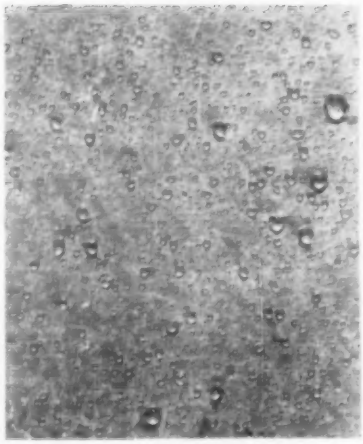
Detroit • Grand Rapids • Chicago

Cover Story

A Study of Repellency

While water is indeed man's most useful substance and the most abundant material in nature, it is also the vehicle of corrosion. This factor has caused scientists to investigate a thousand possibilities of corrosion prevention and inhibition. Years ago when the studies were started, it seemed a rather simple problem. Today, after years of research, science would accept a suitable compromise.

Lloyd Gilbert of the Rock Island Arsenal is one of the many scientists who is chasing the answer to corrosion. His approach is, that to improve the corrosion resistance of phosphate coated steel, they may obtain results by keeping the corroding substance away from the phosphate covering. To achieve this, they have rigged an apparatus which drops a measured amount of distilled water from a measured height onto the silicone covered phosphate coated steel.



Drops of water on a silicone covered phosphate coated steel surface

The picture on our cover is the product of this experiment. The dispersion of the droplets of water becomes a measure of repellency. The picture is *not* photographically enlarged, but is a direct print of a negative obtained from shotting through a microscope which enlarges the area by ten magnifications.

The cover, thus, becomes a startling, if somewhat curious, design. Since this is an issue which is devoted to water purification and waste disposal, it was felt that such a pictorial representation of water would be exciting and interesting. (Water does get into the strangest and most exciting shapes and places!)

We are indebted to the Rock Island Arsenal, Rock Island, Ill., and to Lloyd Gilbert, particularly, for the cover picture.

—The Editor

Deal Yourself a Full House!
Promat means results in protective materials
From surface cleaning to finished sealing, these Promat-Quality products can help you "cash in" on 18 years of research dedicated to one purpose . . . *lasting*, protective beauty for metal:
OPEN
with Promat Acid Addition Agents to insure uniform acid action and clean, oxide free surfaces for the successful application of any electrodeposit.
RAISE
with Promat Addition Agents for cyanide, acid zinc, copper and cadmium plating. Fine grained, uniform deposits that are economical, easy to handle, and excellent for secondary films.
PROTECT
. . . *your raise with the Proseals.* The ultimate in protection for electrodeposited zinc, cadmium and alloys of aluminum zinc and copper. Available in olive drab, bronze and bright phases.
Deal yourself a full house for a "winning hand" in the Preparation, Plating and Protection of metals! Write for details, today.
PROMAT Division
Poor & Company
851 S. Market St.
Waukegan, Illinois
Gardena, Calif. • Philadelphia, Pa.

ANALYSIS OF ELECTROPLATING AND RELATED SOLUTIONS

by K. E. Langford, A.R.I.C., A.I.M.

387 pp. + XI Published 1952

AES Members $6.80

Non-members $8

Contains 265 methods, many new, for the determination of principal constituents and major impurities in electroplating solutions, pickles, dips and etches, phosphating solutions and electrobrighteners, together with chapters on sampling, the control of cleaners, etc., the analysis of plating salts and of water, physical and physico-chemical methods of analysis, the preparation of standard solutions, and a good selection of tables. Methods suitable for the foreman plater are printed in heavy type, whilst paragraphs on theory and limitations appended to each method will make an immediate appeal to managers, engineers and foremen whose job it is to interpret or act upon the results presented by the chemist.

AMERICAN ELECTROPLATERS' SOCIETY

445 Broad St. Newark 2, N. J.

✓ *Please enclose check or money order with your order*

MICCRO COATINGS
Make Tough Jobs EASY!

MICCROSOL E-1003

Today's outstanding heat-cured rack coating. Meets industry's highest standards for corrosion and abrasion resistance.

MICCROSTOP

For extreme accuracy in masking parts for all plating cycles.

MICCROMASK

Provides complete masking protection for hard chromium plating.

MICCROPEEL

A special lacquer that can be peeled easily from parts after all plating cycles.

MICCROWAX

Two waxes widely used for selective stop-off. C-562 for hard chromium; C-600 for high temperature cycles.

MICCROTEX

An air-dry rack coating for all plating cycles. Excellent for patching and repairing.

MICCROTAPE

An extruded tape which provides unexcelled protection for plating racks, and for masking parts prior to selective plating.

MICCROTUBE

Extruded tubing especially suited for use on contact wires, and for selective plating of simple parts.

MICCROLOID

Corrosion-resistant industrial maintenance paint.

• WRITE FOR PARTICULARS ON COMPANY LETTERHEAD

Developed and manufactured by experienced platers

MICCRO Products

MICHIGAN CHROME *and Chemical Company*

8615 Grinnell Avenue • Detroit 13, Michigan

Industry News

Doepke celebrates production feat with gold plated model.

Doepke Produces 2,000,000th NesTier. Production of the two-millionth NesTier materials handling box was announced today by The Chas. Wm. Doepke Mfg. Co., Inc. Gold plated for this special event, the Model No. 175 NesTier came off the production line at 3:20 P.M. on May 16, four years and one month after the first unit was manufactured.

Wilbur E. Kidder, safety manager of Behr-Manning, right, holding plaque, shows Elmer G. Schacht, president, the Award of Honor which Behr-Manning received from the National Safety Council. Members of the Behr-Manning safety committee looking on are, l. to r.: Harry R. Meyer, Anthony S. Susko, Maynard F. Witherell, Irving W. Lobdell, James F. Corr, Louis J. Struzenski, Patrick J. Mastan, Charles W. Teale, Norman F. Coons, Joseph L. Biehl, Philip Hall, Joseph J. Butsch and J. Ernest Boehme

Behr-Manning Captures National Safety Award. Receipt for 1954 of the National Safety Council's Award of Honor, its highest, is announced at Troy, N. Y., by Behr-Manning Division of Norton Company.

To earn it, nearly 2,000 employees worked nearly 4,000,000 man-hours with only 12 lost-time or disabling injuries—equivalent to a man's working 165 years per injury. Behr-Manning attained a frequency of injury 69 per cent better, and a severity rate 90 per cent better, than the average for its industry.

The achievement was commemorated with a series of employee safety meetings which emphasized the extension of safety consciousness to the home, and were featured by a special film in which President Elmer G. Schacht congratulated the employees.

Low Cost Temperature Control Solves High Cost Process Water. How big are the bills your plant shells out for process water? Management of The Detroit Edison Company wasn't too pleased over footing a water bill from the city of Detroit. Water—684,000,000 gallons a year—is used in eight of the Detroit Edicon Company's Detroit-area substations as a coolant for 42 transformers.

Coupled with a desire to lower its water bill, the utility company also wanted to give every support to a local water conservation program. For several years, Detroit, like many cities across the country, has faced a serious water shortage.

Robert A. Ashley, an employee at Detroit Edison's Grand River substation, suggested to Leo Harris, engineer on the utility's electrical system staff, that some sort of regulator be used to stop the water intake once the transformer was cooled sufficiently. This chance suggestion won a $2,000 award for Ashley.

When he came up with the prize winning suggestion Ashley said, "These valves will save the company about $47,000 per year." This equals an annual drop in water consumption of 372,000,000 gallons.

Engineer Harris set to work planning and designing such a system for regulating the flow of cooling water into the transformers. The problems were many. Should the transformers be allowed to overheat and burn out, the loss would be far greater than the cost of several thousand gallons of water. The installation had to be low in cost in order to result in actual savings for the company. Also, maintenance costs would have to be at the minimum, requiring only available personnel.

To assist him in the details of the temperature-regulating system, Harris called upon industrial controls experts from the Fulton Sylphon Division of Robertshaw-Fulton Controls Company. Together they worked out a low cost, maintenance-free system, and a test installation was arranged.

Six temperature-regulating installations were made on transformers, using the No. 926 Sylphon Temperature Regulator, $1\frac{1}{2}$ inch valve size. They operated in this manner: as the temperature of the water in transformer jacket rose, the Sylphon regulators opened to admit a greater flow of cooling water. Conversely, the regulators slowed down the flow as the transformers became cooled. Accurate records were kept during the six-month test period, and comparison data on water consumption for both controlled and uncontrolled transformers compiled.

The result: During the test period the six temperature-controlled transformers saved the company $300 in water costs, while the price of each regulator was less than $130.

Industry News

Five Sludge Decomposition Units Operated by Consolidated. Consolidated Chemical Industries Inc., one of the world's largest producers of sulfuric acid, has put on stream a large sludge acid regeneration unit at its Baytown, Texas plant. A second unit at Houston will go on stream in mid-June, making a total of five sludge decomposition units operated by Consolidated.

The new units are unprecedented both in function and capacity. They are capable of producing strong, white acid from any spent sulfuric acid, regardless of hydrocarbon content.

The new facilities solve the oil refineries' spent acid disposal problem and eliminate the danger of stream and air pollution. They also offer a savings in capital investment on the part of refineries by eliminating the need for burners, hydrolyzers and concentrators in the treatment of heavy sludge acid. Sludge acid is a byproduct in the manufacture of aviation gasoline, benzene, lube oil, kerosene, mineral oil, fuel oil and other refinery products. Certain sludges from chemical plants will also be processed.

The new Baytown and Houston plants make use of a process in which the sulfur is extracted from heavy sludge acid and recombined into new acid.

The various sludge acids are first blended to produce a charge stock of suitable content for the most efficient regeneration. The blended sludges are then fed to a combustion chamber by a spray burner which atomizes the acid with compressed air.

The sludges are burned and reduced to sulfur dioxide (SO_2), carbon dioxide (CO_2) and water vapor (H_2O). The gases then pass through a dust collector, are cooled on a waste heat boiler, then scrubbed with weak acid and the temperature is further reduced to about 80° F. They are then passed through a mist separator. Next, the gases are dried, picked up by the main blower and passed through heat exchangers, then to the converter where the sulfur dioxide (SO_2) content is oxidized in the presence of a catalyst. From the converter the SO_3 gas is cooled and then sent to the absorbing tower where it is converted into 98–99 per cent acid.

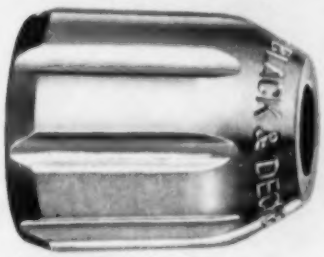
After the acid is cooled, it is sent to storage to await shipment by tank truck, tank car or barge.

New Sarco Sales Agents. H. L. Simmons, president of Sarco Company, Inc., has announced the appointment of the following new sales representatives for Sarco Co., Inc., and Sarcotherm Controls Inc.: C. H. McGuiness Company, 505 S. W. Seventh St., Des Moines, Iowa; Steam Engineering Service Company, V. F. Vallero, president, 620 12th St., Denver, Colo.

now you can get this brilliant finish directly on zinc die castings!

No electroplating--no mechanical finishing!

PART AS CAST



TREATED WITH NEW IRIDITE

NEW IRIDITE® (Cast-Zinc-Brite)

brightens zinc die castings by chemical polishing, protects against corrosion

NOW, FOR THE FIRST TIME you can get a brilliant, decorative finish directly on zinc die-cast parts . . . without mechanical finishing, without electroplating! The luster is provided by the *chemical polishing* action of new Iridite (Cast-Zinc-Brite) solution. Even surface blemishes, such as cold shuts, are brightened by this new process. No electrolysis. No special equipment. No specially trained personnel. Just a simple chemical dip for a few seconds and the job is done. And, this new Iridite has been *tested and proved* in production.

CORROSION RESISTANCE, TOO! New Iridite (Cast-Zinc-Brite) provides exceptional corrosion resistance for bright-type chromate finishes . . . also guards against blueing or darkening by eliminating zinc plate formerly required in bright chromate finishing of zinc die castings.

AS A BASE FOR ELECTROPLATING—Lower mechanical finishing costs are possible where plated finishes are *required* since the brightness provided by this new Iridite may be sufficient.

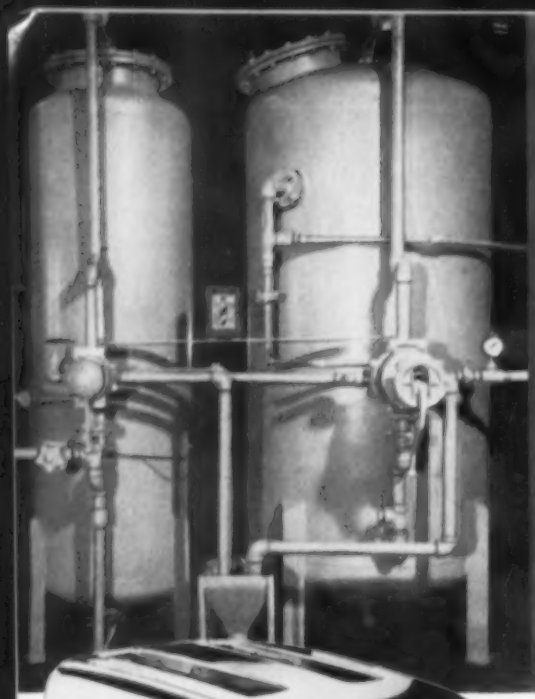
LET US SHOW YOU what Iridite (Cast-Zinc-Brite) can do for you. Send us at least a half-dozen typical zinc die-cast parts for FREE PROCESSING for your own tests and evaluation. Or, for immediate information, call in your Iridite Field Engineer. He's listed under "Plating Supplies" in your classified 'phone book. *IMPORTANT: when you give us samples for test processing, please be sure to identify the alloy used.*

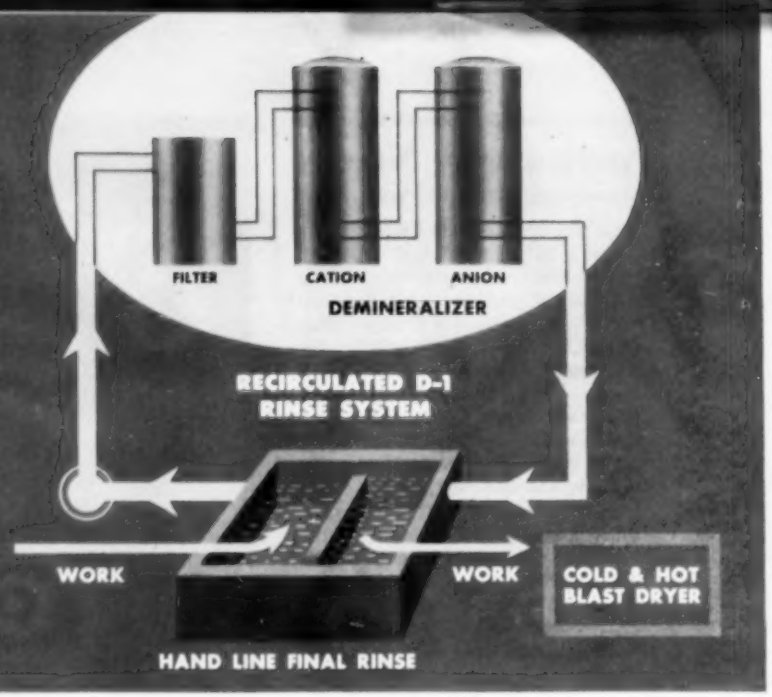
Iridite is approved under government specifications

ALLIED RESEARCH PRODUCTS
INCORPORATED
4004-06 E. MONUMENT STREET • BALTIMORE 5, MD

Manufacturers of Iridite Finishes for Corrosion Protection and Paint Systems on Non-Ferrous Metals; ARP Plating Chemicals

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 808.





Toastmaster improves finish... lowers production costs with INDUSTRIAL'S *Rinse Recirculation System*

Water with only a few grains of natural solids tastes just fine . . . but if you want top-notch plating, even mineral *traces* will interfere . . . and keep your costs up too.

In looking for a way to make a fine product even better the engineers at the Toastmaster Products Division of McGraw Electric Co. studied their plating process. They consulted Industrial and received a thorough analysis of the water used in their plant at Elgin, Illinois. Industrial recommended an ion exchange system for the final rinse water.

Ion exchange unit greatly reduces final color buffing

The Industrial Recirculation System *continuously* purifies the rinse water. This mineral free water permits a final plate job that reaches Toastmaster's high standard with very little color buffing.

IMPORTANT SAVINGS INCLUDE:

- ★ **Buffing costs, necessary power and material**
- ★ **50,000 gallons of water per week**
- ★ **Cost of purifying chemicals is less than 10% of previous method. Using cation and anion resins resistant to chromic acid, it costs only 2.6¢ to re-purify 1000 gallons of water.**

If your company, like McGraw Electric Co., is interested in quality plating and reduced costs, the best investment you can make, is a talk with Industrial's consultants. Their experience with plating problems can save you thousands of dollars.

Write or call Industrial . . . a short outline of your problem will bring specific data.

Write for 24-page book . . .
"Practical Methods for Treatment of Metal Finishing Wastes"
. . . covers major problems and their solutions, including 6 case histories detailed with costs.

CENTRIFUGAL PUMPS • PRESSURE FILTERS • ION AND HEAT EXCHANGERS • RUBBER LININGS • WASTE TREATING EQUIPMENT

Industrial

INDUSTRIAL
FILTER & PUMP MFG. CO.
5914 Ogden Avenue • Chicago 50, Illinois

Industry News

Cowles Open House Attracts Diversified Clientele. Platers, enamelers, and other metalworking technologists and executives joined with leaders from the chemical, food-processing, and chemical industries as guests at the Cowles Open House observing Chemical Progress Week. The observance by Cowles Chemical Company centered around its newest plant in Skaneateles Falls, N. Y.

Occasion for the Open House was the recent opening of Cowles' new research laboratories, now housed with their Skaneateles Falls office, in a new warehouse and office building annexed to the plant.

After the tours, R. F. Huntley, president, and other Cowles officials, were hosts at Skaneateles Country Club.

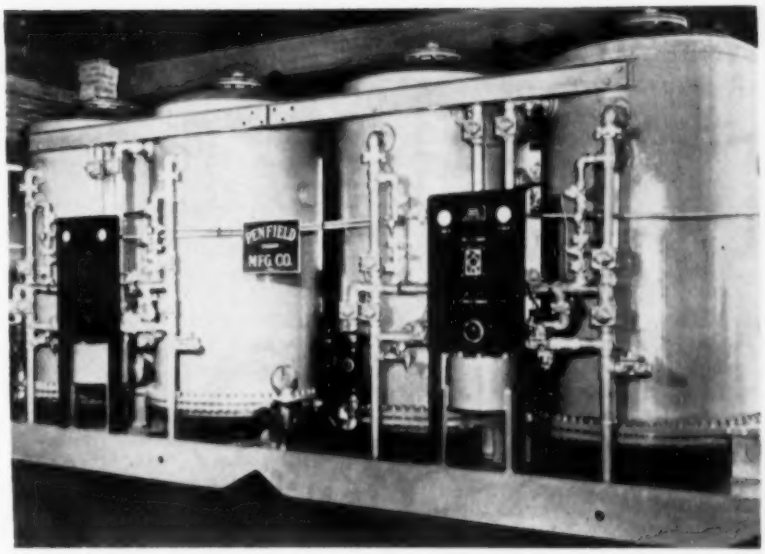
Also, new to most of the guests were the centralized research laboratories, operating under the supervision of Dr. John B. Davidson, research director. The new laboratories include sections devoted to analytical work, detergency research, pilot studies, organic research, product development and application.

Brand New

"Cowles new research laboratories represent a consolidation under one roof of several heretofore separate research, development and sales-service functions," Huntley pointed out. "We expect to realize much more effective interdepartmental liaison and cooperation as a result of this move."

Plans for further expansion and diversification of production are already underway for the Skaneateles Falls plant, although Cowles will continue to operate its older plants in Lockport, N. Y., and Sewaren, N. J.

G. E. Gets High Purity Water at Low Cost. There are two ways of producing water which has a low mineral content—high cost distillation or demineralization which ion exchange has made possible at substantially lower costs. For an important one of a number of key water treating stations at the giant plant, General Electric Company chose an automatic demineralizer manufactured by the Penfield Manufacturing Company of Meriden, Conn. This unit will demineralize city water.



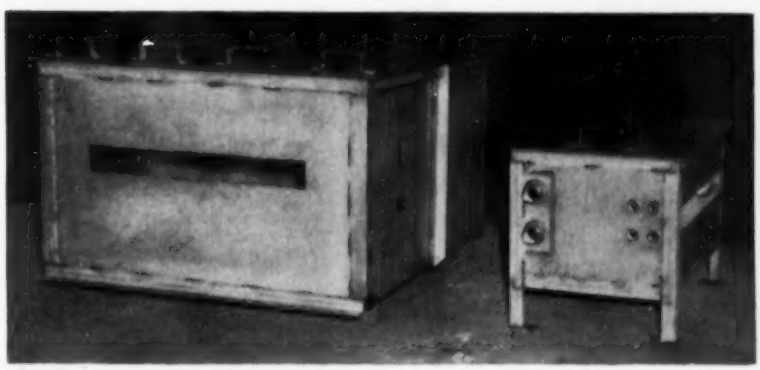
Automatic Demineralizer

The demineralized water is used: (1) to wash refrigerator and freezer cabinets with an alkali water solution and then to rinse them prior to the application of a porcelain enamel finish; (2) in the milling of the frit which becomes the final finish when baked on the cabinets; (3) in anodizing certain parts of the refrigerators and freezers.

The advantages of demineralized water (less than 5 ppm $CaCO_3$) claimed by the manufacturer are these:

(1) Without water of this degree of purity, color control in the many different colors currently used on GE appliances would be impossible. Similarly, any anodizing operation would be imperfect and troublesome because of metallic deposits and discolorations.

(2) Less cleaning solution is required



Stortswelding—best for tough jobs

PLATING TANKS by the thousands have proved that Stortswelding pays off in maintenance savings—in more years of tank life per dollar. You can also rely on Storts for other special processing tanks—like the pair illustrated—because Storts has only one standard of quality. Sound design, carried out with correct procedures, is the Storts foundation for long life performance.

42 STONE STREET — STORTS WELDING COMPANY INCORPORATED — MERIDEN, CONN.

Manufacturers of Welded Fabrications to Specification

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 810.

Industry News

and that which is used does a better job since no precipitate (ordinarily formed by impurities and cleaning compounds) is left on the ware.

(3) Without deposits on the metal surfaces, the final finish (which is put on in three coats) forms a better bond with that surface.

(4) Complete quality control is possible in the mill room since the water purity is a known and unvarying factor rather than subject to seasonal and day-to-day fluctuations in purity.

(5) Costly buffing operations necessary for removing water spots are eliminated since there are no such spots left with demineralized water.

At Appliance Park, demineralized water was chosen over distilled because the cost of distilled water normally runs several times that of demineralized water. Demineralization with the latest available resins removes all types of impurities, ionizable and non-ionizable, including minerals, organic gases and bacteria. All trace metals such as sodium, potassium, calcium, magnesium, iron, copper, etc., are effectively removed along with all salts such as sulfates, carbonates, bicarbonates, chlorides, etc.

The entire regeneration cycle is completely automatic, including rinsing and recutting in the effluent when desired resistivity (purity) is reached. During the regeneration cycle, the regenerative tanks are automatically refilled with water so that fresh acid and caustics may be added in preparation for the next regeneration cycle.

General Electric's new demineralization installation at Appliance Park, in addition to employing the most effective ion exchange technique available to industry, also provides the advantages of completely automatic operation. Costly and time-consuming errors that occur in the manual operation of regeneration cycles are avoided, desired high purity of the effluent is an automatic certainty, and operating costs are cut to a minimum.

General Electric Supervisor Names Wagner Brothers' New Automatic Plater. Ray D. Andrews, a supervisor at General Electric's Schenectady plant, submitted the winning entry in Wagner Brothers' "Name the Automatic" contest. It was announced at the Final Banquet concluding the 1955 Industrial Finishing Exposition that, out of 700 entries, Andrews' *Platocrat* had won the complete assortment of high fidelity audio equipment, including turntable with pick-up, amplifier with remote control, speaker cabinet and tape recorder.

Wagner Brothers wishes to thank all contestants for their efforts in providing a name for the new fully automatic plating mechanism and for their interest in the Wagner Exhibits.

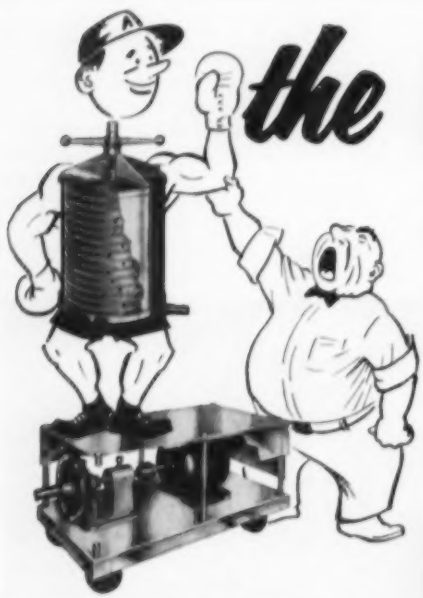
Casalbi Buys Globe. Announcement was made by Clifford M. Sparks, president of Casalbi Company, Jackson, Mich., of the purchase of Casalbi Company of the nationally known Globe tumbling barrel from the Hupp Corporation of Cleveland, Ohio. The purchase includes all machinery and equipment, patents, good will, etc. Fast production will start in Jackson early this month. Globe tumbling barrels have been serving industry since 1902.

Chromic Acid Producer. Representing the first completely integrated facility of its kind in mid-America, a new installation for producing chromic acid has been put into operation at the Painesville (Ohio) works of Diamond Alkali Company, according to an announcement by Frank W. Jarvis, general manager of the firm's Chromium Chemicals Division. Diamond's other chromic acid plant is located at Kearny, N. J.

Because of its central location in the industrial "heart" of the midwestern region, the new plant will enable Diamond to give users of chromic acid faster deliveries and better service on shipments from Painesville, Jarvis explained. It is also expected to make possible savings in freight costs.

Produced from African-imported chrome ore, chromic acid finds broad industrial application. In addition to the manufacture of paint pigments and chromium plating, it is used in making oxidizing agents for drugs and pharmaceuticals, in processing edible oils, and in producing catalysts for petroleum refining.

More H_2SO_4. Consolidated Chemical Industries Inc. will build a large contact sulfuric acid plant at Le Moyne, Ala.,

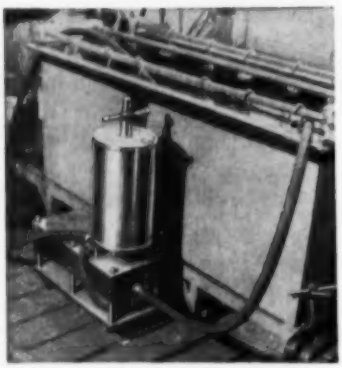


the Winner

on all counts

against pitting, spotting, rejects and reworking

EVERY TIME



The Alsop "Sealed-Disc" Filter is a sure winner *every time* that it's called on to knock-out dirt, sludge and even the invisible impurities from your Plating Solutions.

"Sealed-Disc" Filters remove more impurities with less effort and in no time at all. That's because they're designed to meet Plating room requirements. They're smaller than conventional filters, yet capable of handling equal volumes of solutions. It will pay you to invest in a *Winner*—"Sealed-Disc" Filter. You can depend on its proved "knock-out" performance for continuous or now-and-then operations. See your regular Plating Supplier or write for a Catalog—it's free.

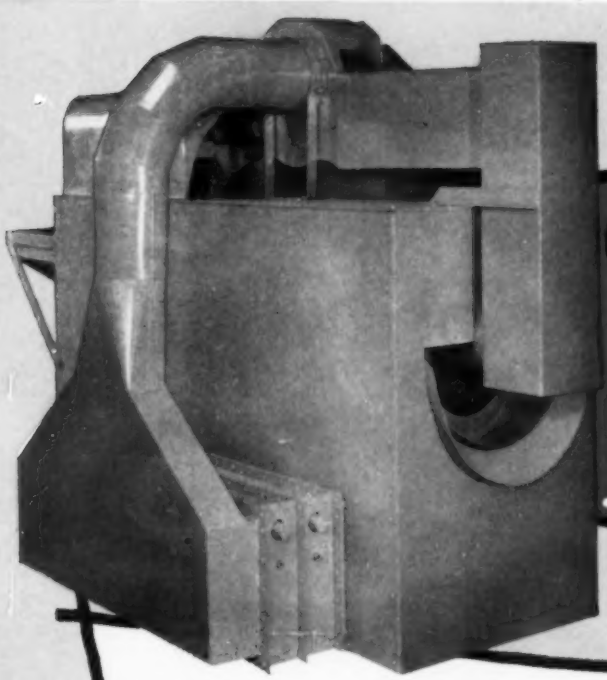
You can depend on a "Sealed-Disc" Filter for better finished plated work with savings in time and labor.

ALSOP ENGINEERING CORPORATION

1008 FINE STREET • MILLDALE, CONNECTICUT

Positive Filtration

FIRST STEP IN CUTTING COSTS



Bone Dry.. Up To 900 Quarts Of Parts Per Hour ...Automatically!

LASALCO's *New* SPIRAL DRYER

SPECIFICATIONS

SIZE: Length 5' 0", Width 4' 6", Height 6' 0"

DRUM SIZE: 22" Diameter, 72" Long, 9" Screw

DRUM PERFORATIONS: ⅛" (Other sizes available)

DRYING TIME: (Aver.) 3-5½-9½ minutes

PRODUCTION: 30 to 900 Quarts per hour (40 to 120 cubic feet)

DRIVE: ½ HP 220/440 volt, totally enclosed ball bearing motor, 1200 RPM

DISCHARGE CHUTE: 20" From Floor (minimum)*

LOADING CHUTE: 42" From Floor

HEATER: Steam—Aerofin blast coils with 1 HP fan for recirculation of air. (Also available with gas heat.)

*Can be arranged for any height from tote pan to 55-gal. drum.

- Virtually eliminates *all* drying labor.
- Hot blasts parts completely dry over a 3-speed spiral—automatically—regardless of design, recesses or contours in the work.
- Automatically unloads into barrels or tote pans. Instantly ready for the next load.
- Specially designed heater eliminates all moisture from the air.
- Replaces up to 3 sawdust tumblers plus 2 or 3 centrifugal dryers.
- Can be arranged to take full hopper loads from final hot water rinse without handling.

Write Today For Details On This Time Saver And Money-Maker

LASALCO, INC.

HOME OFFICE
2820 LaSalle St. • St. Louis 4, Mo.
PRospect 1-2990

IN TEXAS
1113 Perry Road, Irving (Dallas), Texas
Blackburn 3-4921

Industry News

according to an announcement by G. L. Bond, president of the company. Construction will get under way at once and completion is expected by mid-1956.

This sulfuric acid plant will cost $2,000,000 and will be located adjacent to Courtauld's (Alabama) Ltd. viscose rayon works. It will incorporate the latest advances in engineering design. The raw material required, sulfur, will be supplied by water transportation to company docks on the Mobile River.

The new contact unit in Alabama represents the latest step in an expansion program designed to meet the steadily mounting requirements of industrial customers for this basic chemical in the South and Southwest.

These spent sulfuric acid regeneration units are the largest ever constructed.

AES SUSTAINING MEMBERSHIP PROGRAM

Four more progressive firms have joined the AES Research effort through the important medium of the Sustaining Membership program. The new firms are:

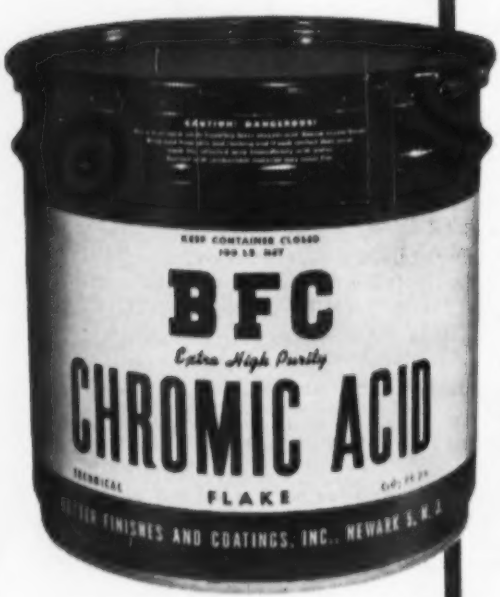
Firm and city	Branch credit
Crane Equipment & Supply Co., Inc. Waterbury, Conn.	Waterbury
Harper-Leader, Inc. Waterbury, Conn.	Waterbury
John Oster Manufacturing Co. Milwaukee, Wis.	Milwaukee
Parker Pen Company Janesville, Wis.	Milwaukee

Number of Sustaining Members supporting AES research through this month 315

Number of Sustaining Members through last month 315

A new mass spectrometer, recently installed at U. S. Steel's Applied Research Laboratory in Pittsburgh, Pa., analyzes gases and vapors by smashing their molecules into fragments and weighing the resulting atoms and radicals. In the illustration, a research scientist has the spectrometer set for process monitoring. The graph shows a tracing and retracing of a peak of one given area. This is the first of its kind to be used in the steel industry

looks good-
is good



First thing you notice about BFC Chromic Acid is its shiny cherry-red color as it comes off the flaker. It looks good and it is good. Its chemical analysis is as fine as its physical appearance.

Our plant is modern; beautifully equipped; operated by men who are real proud of the product they make. Your orders will get personal attention of owner-managers who value your business. When you are in the market, why not call us?

BETTER FINISHES & COATINGS, INC.

268 Doremus Avenue,
Newark 5, N. J.

2014 E. 15th St.
Los Angeles 21, Calif.

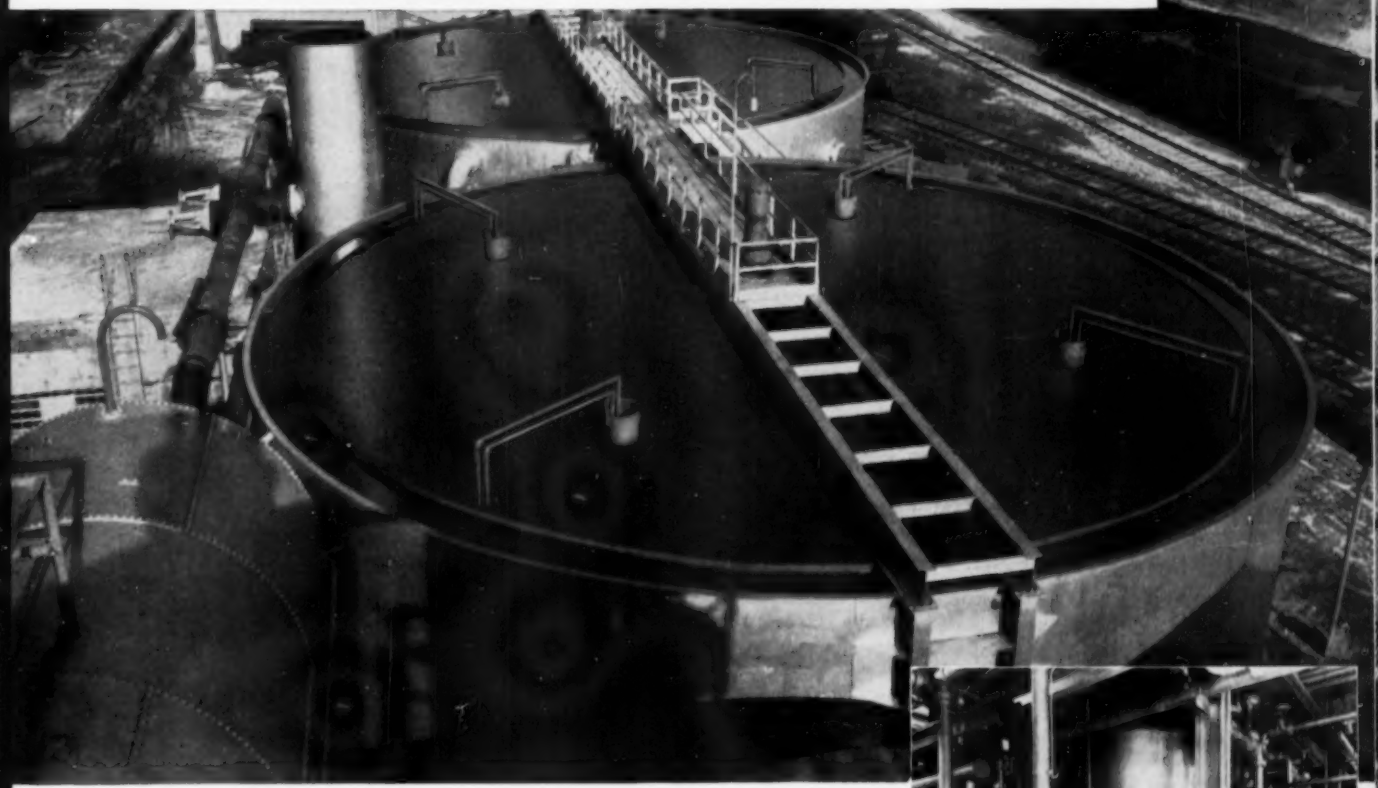
FREE COURSE IN ELECTROPLATING

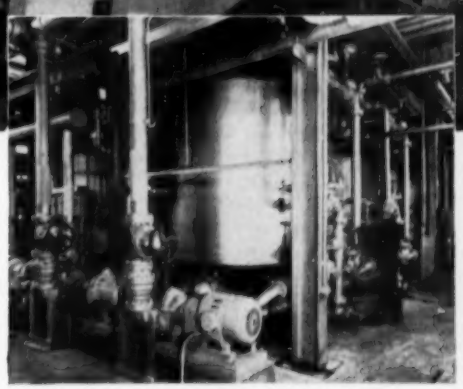
The Fall term in Electroplating at the Brooklyn Evening Technical High School, 29 Fort Greene Place, Brooklyn, N. Y., begins September 14, 1955. Laboratory experiments include analyses of copper, nickel, chromium, silver baths, hardness test, chemical tests for thickness; Hull cell study, anodizing; and analyzing plating solutions. Classroom discussion covers such topics as tank area calculation, review of chemistry, wetting agents, *p*H brighteners, pitting, buffer agents, throwing power, specific gravity, Baumé readings, dummying, deionizing, filtration, reading graphs.

Registration begins September 12, 1955 and daily thereafter from 7:00 to 9:00 P. M.. Classes will be held on Monday and Wednesday from 6:45 to 8:15 P.M., in addition to six Friday nights during the term. The term begins September 14, 1955 and ends January 31, 1956. For further information, contact L. Serota, room BW17 or 3E10.

problems in water-conditioning . . .

PROCESS WATER AND WASTE TREATMENT FOR PLATING





This Cochrane installation consists of two Reactors 54 ft. in diameter, a complete demineralizing system with capacity of 45,000 lbs./hr. The demineralizing plant consists of 4 cation units 9' dia. x 9' high and 4 anion units 8' dia. x 8' high. Water from the Reactor is first passed through 5 pressure filters 9'6" dia. x 5'0" high to remove residual turbidity from coagulated water. The water is then passed through the cation and anion units with resultant electrolyte reduction to 5 to 10 ppm.

Cochrane's Product Line

meets your treating requirements.

Above is a complete water conditioning system used in production tin plating, just one of many applications of Cochrane's water conditioning equipment to process industries.

Cochrane also manufactures equipment for the treatment of plating waste effluents. Ion exchange equipment effectively recovers chromic acid and removes metallic contaminants to increase efficiency of plating solutions, permit re-use of rinse water and eliminate danger of stream contamination.

Cochrane's background assures you the right answer in every phase of water and waste treatment. Why not consult Cochrane first? Write for Bulletins 5800-B and 5001-A.

Cochrane
CORPORATION

Representatives in 30 principal cities in U.S., Toronto, Canada, Paris, France; La Spezia, Italy; Mexico City, Mexico; Havana, Cuba; Caracas, Venezuela; San Juan, Puerto Rico; Honolulu, Hawaii.
Pottstown Metal Products Division—Custom built carbon steel and alloy products

3195 N. 17TH STREET, PHILADELPHIA 32, PA.
NEW YORK • PHILADELPHIA • CHICAGO

Demineralizers • Hot Process Softeners • Hot Zeolite Softeners • Dealkalizers • Reactors • Deaerators • Continuous Blowoff Systems • Condensate Return Systems • Specialties

Personals

Henry R. Merrill has been appointed general sales manager of the Behr-Manning Division of Norton Company. Merrill, a director of Behr-Manning and its assistant general sales manager for the past two years, succeeds the late **John M. Cook.**

Merrill

He joined Behr-Manning's customer service department in 1930, and has been employed since 1934 in field selling operations for the Troy, N. Y., manufacturer of coated abrasives and pressure-sensitive tapes. He was made manager of the Cleveland division in 1937, became assistant industrial trades manager in 1941 and was promoted to industrial trades manager the following year.

He was elected to the Behr-Manning directorate last year and served on the Behr-Manning operating board since 1951, and as a director of the Norton Pike Company since 1946.

Dr. Donald J. McPherson, an expert in the field of titanium and its alloys, has been promoted to assistant manager of the metals research department at Armour Research Foundation of Illinois Institute of Technology, Chicago.

Formerly supervisor of the department's nonferrous metallurgy section, McPherson joined the Foundation as a research metallurgist in March, 1950. He was promoted to supervisor of the physical metallurgy section in January, 1952, and to supervisor of nonferrous metals in February, 1954.

As assistant manager, McPherson will be in general supervision of the operations of the physical metallurgy, nonferrous metallurgy, and extractive metallurgy sections.

Before coming to the Foundation, McPherson served as an associate metallurgist with Argonne National laboratories.

A native of Columbus, Ohio, he received a B.S. degree in metallurgical engineering and M.S. and Ph.D. degrees in metallurgy, all from Ohio State University. He has written many papers on titanium and belongs to several scientific organizations.

McPherson, who served in the navy from 1944–1946, is married and lives with his family at 1306 Braeburn Rd., Flossmoor, Ill.

Arthur J. Seiler, president of the Gates Engineering Company, Wilmington, Del., has announced appointment of **John F. Ewert, Jr.,** as director of advertising and sales promotion. Ewert previously directed advertising for the Strunk Equipment Company of Coatesville, Pa.

Foster D. Snell, Inc., consulting chemists and engineers announce the following promotions and additions:

Shepherd Stigman promoted to assistant director of Personnel and Public Relations. Formerly assistant to the director of Personnel and Public Relations, he joined Foster D. Snell, Inc., as a chemist in 1951. Stigman was a chemist with Container Corporation of America and Brookhaven National Laboratory. He has a B.S. degree in chemistry from City College of New York.

He is a member of the ACS, American Institute of Chemists, Chemists' Club of New York, Chemical Industry Association, American Association for the Advancement of Science, New York Academy of Sciences, Young Men's Board of Trade of New York City.

James Corbett as chemist-pathologist in the Bacteriology and Technology Department. He will be engaged in toxicological studies of new compounds. Corbett has a B.S. from the University of Notre Dame and was formerly with E. R. Squibb & Sons and with Private Brands, Inc.

Murray E. Ferencz as a chemist in the Surface Chemistry Department. Ferencz was a chemist with Onyx Oil and Chemical Co. and has a B.S. degree from Long Island University.

Morris Glazer as a chemist in the Surface Chemistry Department. Glazer has a B.S. from Brooklyn College and was formerly with New York Sugar Trade Laboratory, Inc., as a chemist.

Sidney Gottfried as a chemist in the Product Development Department to specialize in paints and varnishes. Gottfried has extensive experience in the paint field including positions as chemist with Basic Varnish & Research Corporation and Falk & Company. He is a professional engineer in New York State and holds a B.S. degree in chemical engineering from City College of New York. Gott-

Appointed to New Posts by Behr-Manning

Appointments of three men to executive posts in the sales organization of the Behr-Manning Division of Norton Company have been announced at Troy, N. Y., by **Henry R. Merrill,** general sales manager.

Thomas Trowbridge of Brunswick Hills, Troy, a veteran engineer in the coated abrasives field, was named assistant general sales manager. **William J. Bennett** of Albany became sales manager for the company's eastern region and **Victor F. Perreault,** also of Albany, was appointed industrial trades manager.

Trowbridge, a native of Montclair, made assistant manager of the product engineering department in 1945, and became its manager in 1947. He has been sales manager of the company's eastern region for the past six years.

Bennett, born in Troy, was graduated from Dartmouth College in 1932, studied personnel administration at New York University and has been employed by Behr-Manning since 1939, working successively as salesman, product engineer, Detroit division sales manager, manager of product engineering and, since early last year, industrial trades manager.

Bennett

Perreault

Trowbridge

N. J., studied sales and sales management at the New York University School of Business Administration. He joined Behr-Manning's sales department in 1922 and served as a field engineer in the company's Detroit division. He was sales manager of Durex Abrasives Ltd. in Birmingham, England, in 1930 and 1931, returned to Behr-Manning as a field man in New Jersey in 1932 and, after two years as product engineer, became sales manager of the New York and Philadelphia division in 1935. He was

Perreault, also a native of Troy, studied economics at St. Michael's College in Winooski, Vt., and economics and law at the University of Washington. His work with Behr-Manning started in the sales department in 1944. He served as field engineer, later as sales manager for the Buffalo division and in 1951 was appointed industrial sales manager for the Buffalo and Pittsburgh divisions. His appointment as industrial trades manager was prefaced by a brief period on special assignment at Troy.

Personals

fried is a member of the ACS and the N. Y. Paint and Varnish Production Club.

Elias Kimmel as a physical chemist in the Product Development Department. He will supervise research and development dealing with oils and lubricants. Dr. Kimmel came from the General Chemical Division, Allied Chemical & Dye Corp., where he was a research chemist. He has a Ph.D. from Polytechnic Institute of Brooklyn and a B.S. from Long Island University. He is a member of the ACS, Sigma Xi, and Phi Lambda Upsilon.

Howard F. Kivlin as junior chemical engineer in Engineering Division. He is a graduate of Polytechnic Institute of Brooklyn with a B.S. degree in chemical engineering and is a member of the ACS and the American Institute of Chemical Engineers.

Marilyn E. Randall as a biologist in the Bacteriology and Toxicology Department. She is a graduate of Hood College with an A.B. degree in Biology.

An announcement made recently by **Tim G. Meulenberg** and **Bob Redmond,** president and vice-president, respectively of Automotive Rubber Company, Inc., Detroit, states that **James H. Munger** has been added to the ARco sales engineering staff.

Munger

Before joining ARco, Munger was associated with the Victor Manufacturing and Gasket Company, Chicago. He was Victor's sales engineer for the State of Michigan. Previously he had served with the Roller Bearing Company of America, West Trenton, N. J., in a sales-engineering capacity, covering Michigan and Indiana.

A native of Batavia, N. Y., Munger attended Canisius College, Buffalo, where he majored in mathematics and was graduated with honors. In addition, he did post-graduate work at Cornell University, University of Buffalo, and Wayne University, Detroit, covering a variety of industrial processing and engineering subjects.

Munger resides with his family in Huntington Woods, a Detroit suburb.

Sylvania Electric Products, Inc., announced the appointment of **Dr. Bernard Kopelman** as chief engineer of the company's Atomic Energy Division.

Dr. Kopelman will be responsible for all technical operations, including research and development of atomic fuel elements and reactor compounds.

Formerly a research chemist with Titanium Alloy Manufacturing Company in Niagara Falls, N. Y., Dr. Kopelman joined Sylvania's Metallurgy Research Laboratory in 1944 as a senior engineer. Since that time he has performed a number of engineering and administrative assignments. For the past three years he has served as manager of technical coordination for the division.

A native of Boston, Dr. Kopelman was educated at Clark University in Worcester, Mass. He has published papers in the fields of metallurgy and chemistry on subjects concerning high-temperature metals, rare metals, and atomic energy, and holds a number of patents in these fields.

John F. Esping recently joined the staff of Wyandotte Chemicals Industrial, Railroad and Aircraft Department. He will headquarter in Wyandotte's Kansas City District.

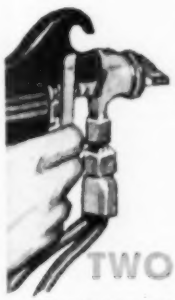
Esping

Esping is a graduate of the University of Kansas and served in the U. S. Air Corps. He is well known to industrial customers in the Missouri, Kansas, Oklahoma and Nebraska area where he sold and serviced metallizing equipment. Esping received training at the Wyandotte Chemicals Industrial Research Laboratories, as well as in several nationally known metal working plants and plating shops before joining the company's Kansas City staff.

TYGON "ATD"

Hot Spray

PAINT



TWO COATS DO THE WORK OF FIVE

Here's the *real* corrosion-protection you've been looking for — for tank exteriors, fume hoods, ducts — everywhere corrosive fumes play havoc with plating room equipment.

With two coats of TYGON "ATD" HOT SPRAY PAINT you get more protection than from five coats of conventional cold spray or brush coatings.

Thickness is the answer. Hot Spray Tygon "ATD" builds 3 mils or more thickness in a single coat. Five to six mils in two passes of the spray gun.

What's it mean to you? Better protection! Longer-lasting protection! And a dollar and cents saving of up to 30% or more in corrosion protection costs.

A ADHESION

T THICKNESS

D DENSITY

GET THE FULL STORY TODAY!

Write for Bulletin ATD-34

No cost. No obligation

Address Dept. PL 855

PLASTICS AND SYNTHETICS DIVISION

THE U. S. STONEWARE CO.

AKRON 9, OHIO

63E-1

Personals

J. F. Koval, vice president of Willow Rubber and Lining Company, Belleville, Mich., recently announced the addition of **Edward H. Hindle** to the Willow Run Rubber executive board and sales staff.

Hindle

Hindle is a graduate of Wayne University where he earned his degree as a mechanical engineer. He joined the U. S. Rubber Company in 1937 and served with that firm in development, product engineering, and sales engineering until his new association with Willow Run Rubber.

Active in engineering and technical groups, Hindle is a member and has been chairman of the Detroit Rubber and Plastic Group. At present, he is a counselor and a member of this group's executive committee. He is a member of the Society of Automotive Engineers and the Engineering Society of Detroit.

With the Willow Run Rubber and Lining Company, Hindle will specialize in molded rubber parts development, production, and sales engineering. In addition, as a member of the executive board, he will take part in general policy making along with the Willow Run Rubber management group.

The appointments of **Harold A. Kahler** as assistant to the vice-president and **Walter B. Ellis** as western district manager have been announced by Promat Division, Poor & Company, Waukegan, Ill., manufacturers of metal finishing processes.

Ellis

Kahler came to the home office after serving as Promat's eastern representative since 1953. Prior to this association, Kahler held positions in the metallurgical and chemical departments of Kaiser-Frazer Corp., and Ford Motor Company in Detroit. He is a member of the AES, ASTM and ASM, and is active as a member of several committees in the societies. Kahler and his family are making their home at 1006 Rogers Court, Waukegan, Ill.

Ellis becomes manager of the Promat west coast division with offices in Gardena, Calif. His previous associations include: plant manager of the Illinois Plating Company, Peoria, Ill.; finishing superintendent of Dura Chrome Corp., St. Louis, Mo., and southwestern district representative for Lasalco, Inc., St. Louis, Mo. He is a St. Louis University Alumnus and will make his home in Torrance, Calif.

Wyman L. Taylor has been appointed San Francisco district sales manager of industrial chemicals of Stauffer Chemical Co. He replaces **R. N. Nason, Jr.,** who has resigned to become an active partner in the E. S. Browning Company.

Taylor is a graduate of the University of California, and after serving as an officer in the United States Navy during World War II, became associated with Stauffer in 1946. After several years in the industrial chemical sales department he was transferred to the Fresno area to become agricultural sales manager in that district.

Rapid Electric Co. has announced the appointment of **Mufit Ogut** to its engineering staff. Ogut came to the U. S. A. in 1946 after extensive schooling in Turkey at Tulas American School and Robert College. He resumed his engineering studies in this country and was graduated from Indiana Technical College with a B.S.E.E. degree. Graduate work was undertaken at Columbia University and at Newark College of Engineering.

Ogut

Ogut's background as development and test engineer at Wallace & Tiernan in New Jersey brings to Rapid Electric a wealth of experience which fits in well with Rapid's program of expansion in the Germanium rectifier field.

FORMAX

the Perfect Combination

FROM START TO FINISH

ZIPPO CLOTH BUFFS

These famous long-wearing buffs run cool under all buffing conditions. High count bias-cut cloth is assembled on ventilated steel centers. Each section is perfectly balanced and faced—requires no raking.

BUFFING COMPOUNDS

Formax produces a complete line of buffing compounds in bar, tube and liquid form.

Our extensive manufacturing, laboratory and testing facilities are at your disposal.

ZIPPO SISAL BUFFS

You have a pleasant surprise coming if you haven't tried the new Zippo bias-type sisal buff. It was specifically developed for steel buffing—to blend polishing grit lines—to cut down stainless steel—and bring up a bright lustre.

Other Formax products include the well-known C-20 Flexible Contact Wheels and F-26 Abrasive Belt Grease Stick.

Descriptive Catalogs Sent on Request

FORMAX MFG. CORP.

DETROIT 7, MICHIGAN

"THE FOUR McALEERS"

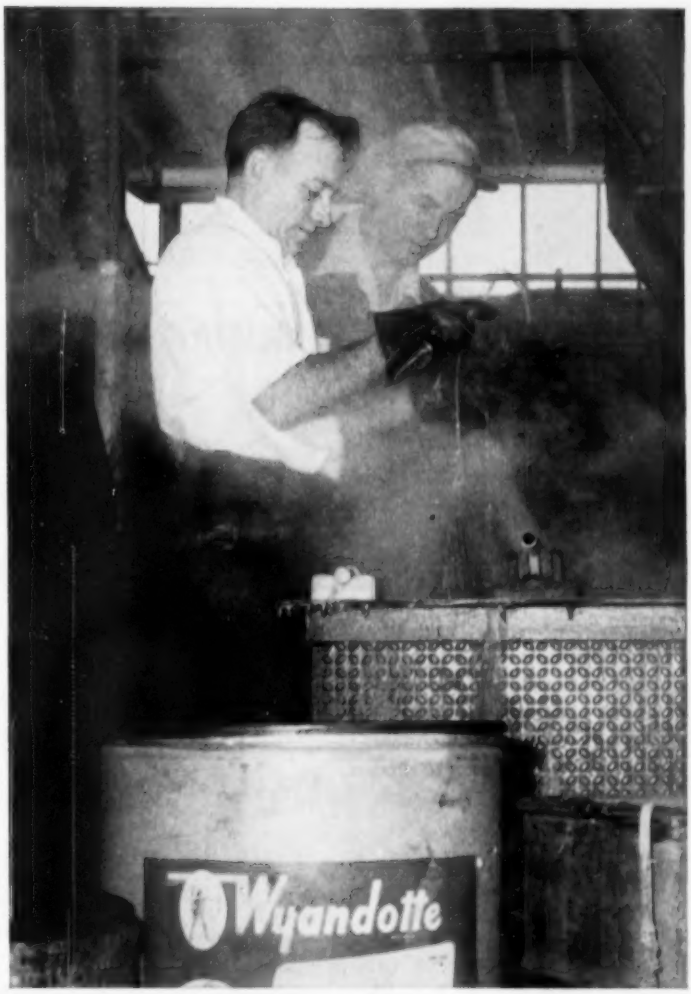
Wyandotte metal cleaners lick job shop's cleaning problems

Any plating operation, large or small, is faced with the problems of keeping production costs down, quality up. The Reliable Plating Corporation, Chicago, Illinois, uses Wyandotte metal cleaners, to help solve these problems, in a variety of standard job-shop applications. Says President J. Robert Greenwell: "Wyandotte Chemicals have done an excellent job for us for over fifteen years. We consider Wyandotte products the answer to job-shop cleaning problems."

Reliable Plating Corporation uses Wyandotte B.N. and C.S.R. for electrocleaning; Wyandotte W.L.G. for soak cleaning; Wyandotte 321 and Burnek 22 for barrel finishing. In each instance, Reliable reports: excellent cleaning and finishing; increased production through elimination of rejects; savings due to long solution life of chemicals; *definitely lower use-cost!*

Wyandotte B.N. is a superior, versatile electrocleaner for nonferrous, as well as ferrous metals. C.S.R.* is a unique reverse-current electrocleaner for removing smut from steel. W.L.G.* is outstanding for heavy-duty soak cleaning; removes even toughest soil deposits. Wyandotte 321, a soap-type compound, and versatile, economical Burnek 22 are excellent for ball-burnishing applications.

For research-developed and production-proved products that will improve the quality of your cleaning, and reduce operating costs, call your Wyandotte representative, now! *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Also Los Nietos, Calif.* *REG. U.S. PAT. OFF.



Soak-cleaning operation at Reliable Plating Corp., Chicago, Illinois, is checked by Vice President Joseph B. Becker (right).

● *President J. Robert Greenwell, of Reliable Plating Corp., is also president of the National Federation of Metal Finishers; was chairman of the Chicago Electro-Platers Institute for two terms.*

Wyandotte CHEMICALS

Helpful service representatives in 138 cities in the U. S. and Canada

Largest manufacturers of specialized cleaning products for business and industry

Personals

Appointment of **William E. Bryan** as director of sales has been announced by Rapid Electro Co. Bryan came to Rapid from American Machine and Metals, Inc., New York. Prior to that he was vice-president of Surveyors Company, Inc., Washington, D. C. He was also associated with Bendix Aviation Corporation and Sperry Gyroscope Company.

Cooney

Bryan

Also announced was the appointment of **Eugene A. Cooney** as director of purchases. Cooney came to Rapid from the Gulf Oil Corporation, New York, and was formerly associated with S. Alexander Company, New York, as warehouse superintendent. Cooney is a Captain in the U. S. Army Reserve having seen active service in the European theatre in World War II.

Norman K. Pettigrew has recently joined the executive staff of Sargeant & Wilbur, Inc., Pawtucket, R. I., as general manager. He had formerly been with C. I. Hayes of Providence for 26 years in various capacities. His most recent position was that of sales and advertising manager, with additional responsibilities in research and development.

Pettigrew operated his own sales and consulting agency, now being handled by his son, before joining Sargeant & Wilbur.

Pettigrew

Battey

As a man who has thorough experience in the heat treating field, having gone through all stages from production to management, Pettigrew is well suited for his new sales and management reorganization job.

It was also announced that **Marshall C. Battey,** of Providence, has joined the Sargeant & Wilbur organization as their New England sales representative. Battey was formerly a sales engineer for C. I. Hayes and has an eight-year background of design and sales experience in the industrial heat treating field.

Steve Jerome has been appointed general manager of Wagner Brothers Equipment Company, Detroit, Mich., according to an announcement by **J. R. Wagner,** president.

Jerome

Jerome has had several decades of widely diversified experience on the engineering, production and management levels of plant operation. Recently, Jerome was in charge of setting-up a new plant in Canada for one of the largest American manufacturers of welding equipment.

Daniel H. Sherman, Brighton, Mass., has been appointed New England representative for the Dawson Corp., North Pelham, N. Y., manufacturers of the Chromplater industrial chrome plating equipment.

Sherman

Sherman, a graduate of Northeastern University with a degree in Chemical Engineering, is a recognized authority on industrial chrome as well as other plating metals. His 10 years experience in this field includes both production and sales. Sherman was recently sales and service engineer for New England with the Ward Leonard Electric Co., Industrial Chrome Division.

QUALITY CONTROLLED WATER

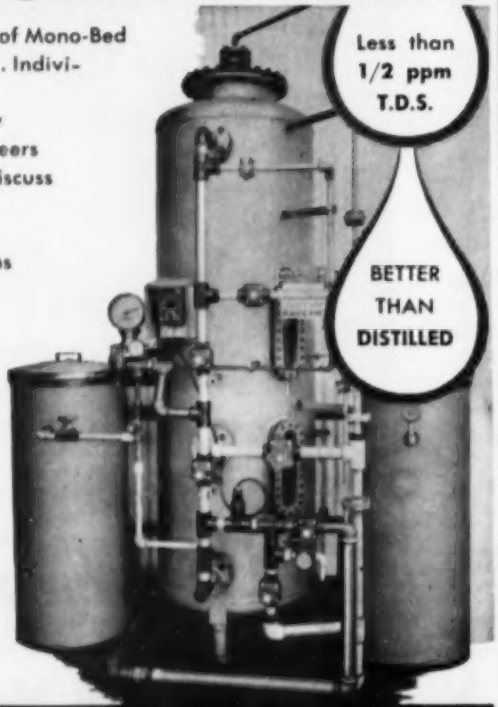
at a fraction of Distillation Cost

L★A Demineralizers

Industry's finest selection of Mono-Bed and Two-Bed Systems. . . . Individually designed to the requirements of your raw water supply. Our Engineers are at your disposal, to discuss your problem . . . Survey your requirements . . . Prepare recommendations and estimates.

WRITE TODAY for COMPLETE DETAILS or FREE Bulletin DM-4

SOFTENERS
DEMINERALIZERS
FILTERS
LIME TREATMENT
DEAERATING HEATERS
ZEOLITES
RESINS



L ★ A WATER SOFTENER COMPANY
1007 Air Way, Glendale 1, California
REPRESENTATIVES IN PRINCIPAL CITIES

Improved Plating Techniques by Baker & Adamson

Vital Engine Parts Protected!

A harder coating, with better corrosion and wear resistance, is produced with a low tin-content B&A fluoborate bath for protecting bearings and other engine parts. Additional uses include depositing coatings on pistons and similar parts to provide marginal lubrication during break-in periods, electro-cladding wire and plating threaded parts for needed lubrication properties.

Soldering Made Easy!

A high-tin-content fluoborate bath produces coatings of excellent solderability on electronic or electrical parts where the use of a non-corrosive flux is desired. It also gives a uniform coating that expedites assembly, and where the parts can be fused, the B&A Fluoborate alloy bath can be used to deposit the solder, eliminating costly hand soldering.

NOW...You Can Plate CUSTOM-MADE Alloy Coatings with B&A Lead and Tin Fluoborates!

These are high-speed, low-cost operations . . . short-cuts to producing better, more economical products.

The plated coatings shown are actually tailor-made to specific requirements with Baker & Adamson Lead and Tin Fluoborate Solutions. When protective and lubricating coatings are required, as in bearings, lead-tin alloys of low tin content are readily plated. Where a deposit of good solderability is desired, as in electronic parts, alloys with 40-60% tin content can be produced. B&A Lead and Tin Fluoborate Solutions, combined in a bath using alloy anodes, produce dense, fine-grained, uniform deposits with pre-determined characteristics. Send the coupon for detailed technical bulletins.

B&A Fluoborate Plating Chemicals Include:

Lead • Tin • Iron • Copper • Nickel • Cadmium
Indium • Antimony* • Chromium* • Cobalt*
Fluoboric Acid

*Experimental quantities only

FINE CHEMICALS
B·A
REAGENTS

Clip to your letterhead and mail today!

BAKER & ADAMSON® PRODUCTS
GENERAL CHEMICAL DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

Please send, without obligation:—

☐ Your Technical Bulletins No. TC38351, RA38351, and RB38351 on applications and techniques for plating lead and tin alloy coatings.

☐ Information on applications of other B&A Metal Fluoborates. Specify type _____

Name _____

Position _____

Company _____

City _____ Zone _____ State _____

PL-8

MEAKER PLATING MACHINES

USED IN WORLD'S LARGEST PLATING PLANT

1200 AUTOMOBILE BUMPERS PLATED EVERY HOUR

The Meaker Company is proud of its contribution in designing and building the plating machines for this plant, put into production shortly after the beginning of the year. The large automobile manufacturer now plates all of the bumpers for its entire production in the one plant.

This is another example of Meaker's engineering and manufacturing ability which has been demonstrated so successfully over the past half century.

MEAKER

Engineered plating equipment is designed for highest efficiency in your particular operation. Call or write today and have a representative from our nationwide sales and service organization survey your problem with you at no obligation.

MEAKER PRODUCTS

THE MEAKER COMPANY

1633 SOUTH 55th AVE. • CHICAGO 50, ILL. • Phone OLympic 2-2110

- Full Automatic and Semi-Automatic Plating Machines
- Strip Steel Plating Equipment
- Wire Galvanizing Equipment
- Batch Type Plating Machines
- Pickling Machines
- Processing Conveyors
- Motor Generators for Plating
- Rectifiers for Plating

Personals

Appointment of **Frank W. Glaser** as a vice president and director of the Alloy Precision Castings Company, Cleveland, was recently announced by **Ronald D. Gumbert,** company president. In his new post, Glaser will be in charge of new development work, engineering and production operations. Alloy Precision is a licensee of the Mercast Corporation, New York, and produces a wide range of precision parts made by the frozen mercury process of investment casting.

Glaser

Glaser, a graduate of City College of New York and Polytechnic Institute of Brooklyn, was formerly vice-president in charge of research and development for the American Electrochemical Corporation, Yonkers, N. Y.

One of the development programs which he directed yielded patents which were the basis for the Borolite Corporation, Niagara Falls, N. Y. In addition to his work with American Electrometal, Glaser also conducted some of the pilot plant operations of Borolite and was likewise a director of the firm.

R. M. Richards, president of Peters-Dalton, Inc., Detroit, announces two major executive appointments made necessary because of the increased activities and growth of the company. **Robert G. Callison,** formerly sales manager, has

Callison

McGuire

been elected to the post of vice-president in charge of regional sales and sales promotion. Callison has been with Peters-Dalton for the past 18 years. Appointed to the position of general sales manager is **T. Kenneth McGuire.** Previously serving as general manager of the Industrial Sheet Metal Division of Peters-Dalton, McGuire has a background of 20 years in this field of industry.

Personals

James L. Oberg has joined Metal & Thermit Corporation.

In his new position Oberg will handle special assignments on metals, Thermit and electric welding processes. He will work with all departments on projects involving manufacturing processes, and will investigate new markets and new uses for existing products as well as potential new products of a metallurgical nature.

Oberg

Oberg has been associated with The Babcock & Wilcox Co. for the past fifteen years. His experience includes research, development and production of welding electrodes, welding processes and fabricated products.

W. E. Noyes, vice-president in charge of sales of The Diversey Corporation, has elevated three men to new posts.

J. A. McMurtry, formerly assistant general sales manager, has been named division manager to head a newly created East Central Division. **C. R. Reid** has been promoted to sales manager, food industries and **H. M. Pickles** as assistant to the sales manager, food industries.

Chase Chemical Corporation of Pittsburgh, Pa., announces that **Clifford Off, Jr.,** has been named to handle the sale of its polyisocyanate resins. These resins are used as a base for chemical foams which are used as insulation, acoustical treatment, sound deadening, and structural reinforcement. Off was formerly with Insul-Mastic Corporation of America, where he was sales manager and a director.

William Whalen was elected president of Canadian Hanson & Van Winkle Company Limited, Toronto, Canada. He is well known in the metal finishing plants of Western Ontario where he solicited business for his company for several years. Whalen started as a salesman with the company in 1921 and his successful efforts in sales led to various executive appointments which enabled him to contribute much to the growth of the company. He was elected vice-president and general manager in 1945 and held this office until his election as President.

Whalen

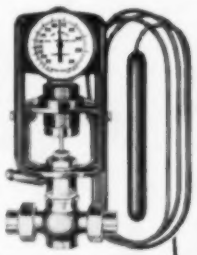
GOLD is costly to plate

DON'T WASTE IT!

Even with traps installed to recover gold, you're *wasting* it...

IF you have to replate frequently
IF solution decomposes
IF there is excessive evaporation

Correct temperature regulation will help eliminate this loss of valuable gold, time and labor.



install Powers

AUTOMATIC TEMPERATURE CONTROL
for All Metal Finishing Processes

For plating tanks and other metal finishing processes. Powers Controls quickly pay back their cost by accurately holding solutions at a constant uniform temperature.

Write for Bulletin 330

POWERS

4

TECHNICAL DATA SHEET

GOLD

IF you plate — GOLD

Too high a temperature can result in:

1. Excessive build up of carbonates.
2. A tendency to spongy deposits.
3. Excessive evaporation.
4. Color variance.
5. Low cathode efficiency.

Too low a temperature can result in:

1. A low limiting current density.
2. Pale deposits.
3. Dark deposits.
4. Inclusion of foreign metals in the deposit (lower carat).

THE POWERS REGULATOR COMPANY

Skokie, Ill. • Offices in Chief Cities in U.S.A. and Canada • See Your Phone Book

(c32)

Sel-Rex

PLATING EQUIPMENT

"PLATEMATES"

Sel-Rex PLATING RECTIFIERS

Time-tested dependable
Completely sealed

Top operating efficiency **AT ALL TIMES** because they cannot corrode... require no maintenance... never need cleaning. The cabinet is gasketed and sealed to withstand highly corrosive atmospheres. Air within the cabinet is cooled by an air-to-water heat exchanger.

There is a Sel-Rex Rectifier for every type Power requirement. A staff of well-trained personnel is provided to assist you in conducting an economical and highly efficient plating operation.

Sel-Rex DOUBLE DUTY FILTERS

Efficient LOW-Cost operation with either ANNULAR bag element or POROUS STONE.

Cuts filter cleaning time to less than 15 minutes! Can be operated *by anyone immediately*. The entire Annular element is secured to the tank cover—lifts out freely and easily for cleaning, either by hand or with the sturdy, hand-operated davit mounted on the tank of larger units. Messy handling of wet and dirty elements is eliminated — you can even clean an element used for carbon treatment without soiling your hands!

The compact design saves valuable shop space—the new Annular element gives **DOUBLE** the amount of filtration area and speed in the same space required by other filters. Standard models from **250-18,000 GPH** capacity.

Larger models built to specifications.

Write for complete literature

NEMA

BART-MESSING CORPORATION

229 MAIN STREET • BELLEVILLE 9, N. J.

Manufacturers and Distributors of Plating and Polishing Equipment and Supplies.

Trade Literature

Please use Reader Service Card to obtain any item in this section

L—802. Control in Water Treating—Prepared with the assistance of leading water treating consulting firms, the new Milton Roy Bulletin 953 describes and illustrates how controlled volume pumps are used in typical industrial water treating systems.

Typical water treating processes described include coagulation systems, lime soda softening, hot process softeners, demineralization, and various types of boiler water treatment systems.

Thorough analysis is given to cooling tower water treating problems as well as methods and systems for waste and sanitary water treatment in this 24-page bulletin.

L—803. Sel-Rex "Jet Plater"—A new, illustrated 4-page booklet on the "Jet-Plater" has been made available by Bart-Messing Corporation, of Belleville, New Jersey.

The new literature illustrates and describes the various features of the unit which include: built-in Sel-Rex rectifier with output rating dependent on the tank size; automatic timer which automatically stops operation when the predetermined thickness is obtained; exclusive "Jet Agitation" which eliminates the need for mechanical agitation; and the centralized control panel from which all operations are controlled.

L—804. Reprint Now Available on the Factors Affecting Design of Water Clarifiers and Softeners—Graver Water Conditioning Co., New York, N. Y. has available technical reprint T-135 "Design of Water Clarifiers and Cold Process Softeners."

This informative paper emphasizes the need for good engineering and intelligent selection of equipment to meet specific applications of water clarifiers and softeners. It thoroughly discusses the many operating factors affecting the dependability and economy of this type of equipment.

There is an increasingly stronger trend toward the use of so-called "high-rate" solids contact units which produce water of a comparable quality to that produced by "conventional" methods. This treated water is produced in a shorter time and at a lower installed cost. The article discusses the many factors that must be known to make an intelligent choice of equipment.

It considers the historical background of the solids contact units, the principles of seeding in chemical reactions, the separation of precipitated solids and detailed equations upon which the actual designs are based.

Sections are also devoted to reported operating results, the ability of the units to handle surges and the theory of design rates vs operating rates.

The paper is illustrated with many diagrams, drawings and photographs.

An additional technical Reprint T-137, "Treatment of Makeup Water with Automatic Mixed-Bed Demineralizer" is now available from Graver Water Conditioning Co., New York, N. Y.

The article discusses a specific eastern utility installation at which a completely automatic mixed-bed demineralizer is located. There is a discussion of the factors that led to the choice of this type of equipment, the actual system itself and the problems of starting up the plant.

There is a section devoted to the operation of the system and the results obtained. This system produces 1,000,000 ohm-cm water for the 1900 psig boilers.

One of the features of this completely automatic mixed-bed system is the graphic control central panel. Besides containing all the recorders, indicators and controls, the panel has an illuminated, graphic picturization of the units. Different colored lights indicate whether each valve is open or closed and which materials are contained in the various pipe lines.

The article is illustrated with photographs of the units and panel, detailed flow sheets and results charts.

Also technical reprint T-134 "Chemical Reactions in Hot and Cold Treatment Units" is now available from Graver Water Conditioning Co., New York, N. Y.

This article presents an impartial study of the many factors influencing chemical reactions in hot and cold process treatment units. Operating results at hundreds of large-scale installations and many series of laboratory tests have been studied to collect this information and draw the conclusions presented. These conclusions are of value when designing or selecting hot process softeners for boiler feedwater treatment, cold process softeners for both industrial and municipal treatment and for special applications such as industrial waste treatment.

Among the factors considered are the effects of the type of anion and preformed precipitates, chemical excesses, temperature, varying concentration of preformed precipitates, and contact with magnesium oxide. The actual test conditions, procedures and observations are discussed in detail and a series of conclusions drawn.

The article has actual test results curves on the many factors studied indicating what can be expected under various conditions. There is also a graphic picturization of both cold process and hot process units, their flow patterns and design features.

L—805. Electroless Plating Comes of Age—This is the title of a 20-page booklet by Dr. Abner Brenner of the National Bureau of Standards. It presents a summary of available information on the commercial uses of electroless nickel plating. Fourteen specific installations and the type of work handled by each are described. The booklet briefly reviews processes for nickel deposition on noncatalytic surfaces. It also reviews equipment and operating conditions needed. Electroless plating is economically competitive with electrodeposition, and with the growth of knowledge the process is expected to become routine in most plating shops.

L—806. Two Bulletins from Pollack—Pollack Products Co., Brooklyn, N. Y. announce the availability of literature describing the determination of free cyanide concentration of copper solutions by their quick "Test Pencil" method, and descriptive literature on the use of the new pocket size "Jiffy Loop" Surface Tension Tester, which provides a quick test method for taking accurate surface tension measurements under production conditions.

L—807. Plastics Brochure—A new four-page, two-color brochure on sprayed metal tooling and vacuum formed plastics has been issued by Glidden Coating Company, Pitman, N. J.

Well illustrated, the bulletin covers the uses of sprayed metal tooling in industry to provide molds which are inexpensive, light, portable, and have excellent heat transmission qualities. The widespread adoption of sprayed metal molds as a tooling method is due primarily to the speed and economy with which the molds can be built.

Sheet forming application is the most rapidly expanding field for sprayed metal molds. The bulletin covers the process in detail, explaining how thermoplastic sheets can be formed or drawn into a variety of shapes and forms over sprayed metal molds.

L—808. Filter Plant Gauges—Simplex Valve & Meter Company, Lancaster, Pa., has prepared Bulletin No. 1002 that features its new line of filter plant gauges. These units can be utilized for the measurement of effluent flow, loss of head, wash water, water elevation and per cent of filter bed expansion.

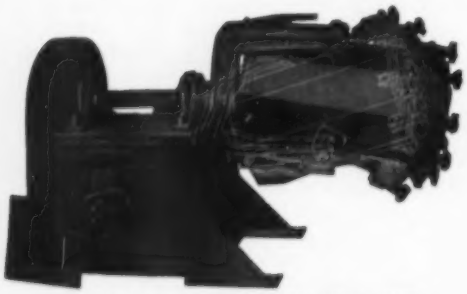
Throughout its 20 pages, the bulletin describes the various types of meters and includes facts on operation, construction, general information, sizes and capacities, specifications and other pertinent data of interest to consulting plant engineers, purchasing engineers and plant operating personnel.

USE "RELIANCE" PRODUCTS FOR

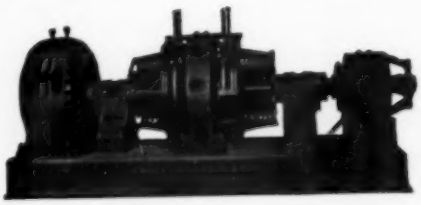
ECONOMY : EFFICIENCY : DEPENDABILITY

LET US SUPPLY YOUR NEEDS FOR YOUR PLATING OR POLISHING DEPARTMENT

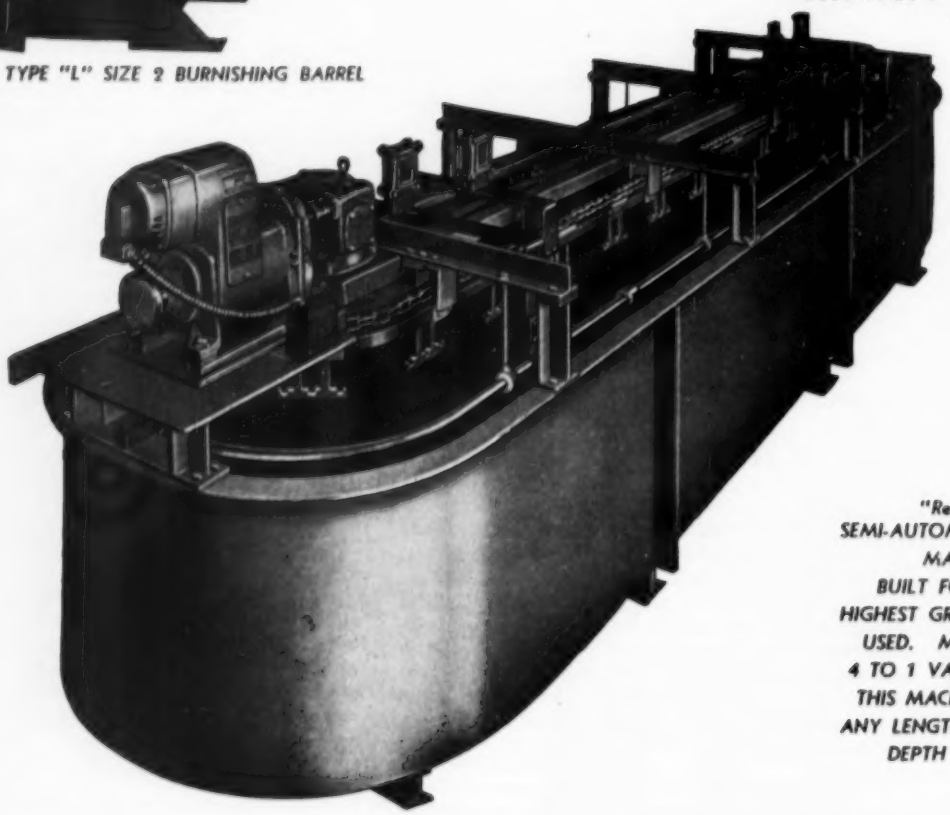
WRITE FOR FURTHER DETAILS



TYPE "L" SIZE 2 BURNISHING BARREL



3000 AMP. 6 VOLT GENERATOR SET



"Reliance" SEMI-AUTOMATIC PLATING MACHINE BUILT FOR SERVICE HIGHEST GRADE MATERIAL USED. MOTOR ½ HP 4 TO 1 VARIABLE SPEED. THIS MACHINE IS BUILT ANY LENGTH, WIDTH AND DEPTH OF TANK.

Chas. F. L'Hommedieu & Sons Co.

MANUFACTURERS of

Plating and Polishing Machinery

Complete Plating Plants Furnished

Chas. B. Little Co.
Newark, N. J.
W. R. Shields Co.
Detroit, Mich.
Powell Calvert
104 Second Street
Feasterville, Pa.

Gen. Office and Factory:
4521 Ogden Ave.

CHICAGO

Branches:
Cleveland
and
Los Angeles

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 823.

CONTROLLED GRAIN SIZE: APW Extrusion Process* controls grain size within definite limits—*minimizes shedding!*

ROLLED FLAT PLATE ANODE SECTION:

This Photomicrograph shows highly irregular, uncontrolled grain size—a major cause of shedding and resultant rough electrodeposits.

APW EXTRUDED ANODE SECTION:

Note small, fully controlled regularity of grain size that promotes uniform corrosion, smoothest electrodeposits, less rejects.

*Pat. Pending

NEW! SHAPED, EXTRUDED APW SILVER ANODES

STANDARD SHAPES:

"RECTANGULAR" "TEAR DROP" "DOG BONE"

The common problem of shedding and all of its costly results in electroplating can now be virtually eliminated with the radically new extruded, shaped silver anodes made by an exclusive APW-developed process.

The small and uniform grain size produced in the new APW extruded anodes is controlled between definite ideal limits as illustrated above. As a result, corrosion is *smooth and uniform*—with consistently smooth electrodeposits. Rejects are a comparative rarity.

The new APW extruded anode provides equally important advantages by redistribution of mass metal in scientifically determined shapes. While conventional rolled flat plate anodes quickly wear to a sharp knife edge from which silver particles break loose readily, APW shaped anodes maintain substantially rounded edges for practically the complete life of the anode. Anode area is also appreciably prolonged. After 85% by weight has been plated off, *this APW anode retains 80% of original active surface area!* You profit with the longer, useful life of the anode . . . polarization is minimized . . . there is less silver scrap to be refined.

APW will develop special anode shapes to meet particular plating bath conditions. You are thus assured of utilizing the silver you buy in anodes most efficiently. Feel free to consult us on any anode problems you may have. ★ ★ ★

THE AMERICAN PLATINUM WORKS

APW

231 NEW JERSEY RAILROAD AVENUE • NEWARK 5, NEW JERSEY

To Plate Without A Hanging Hull Cell
Is Like Sailing A Ship Without A Compass!

Stop Guessing—Get Your HANGING HULL CELL *Now!*

THE HANGING HULL CELL UNERRINGLY POINTS OUT TROUBLES RIGHT IN YOUR PLATING PRODUCTION CYCLE!

From . . . The Meter . . .

- Average operating current density.
- Current variation throughout the tank.
- How to locate poor anode contacts.
- How to distribute anodes.
- Proper current for making laboratory Hull Cell tests in your plating range.

- Progress of the plating process at any given time—including Full Automatics.
- Effects of agitation in production.
- Effects of temperature in production.
- Overall performance of the entire finishing operation (Buffing, Cleaning, Plating), including sequence plating such as copper, nickel, chrome. The panel can be examined at any desired point.
- Bright plating range and effect of impurities.

From . . . The Test Panel . . .
(Steel or Polished Brass)

THE NEW MODEL HANGING HULL CELL GIVES QUICK CHECKS OF YOUR BATHS!

Catch costly plating troubles at the source—right at the plating tank! Use of the Hanging Hull Cell for plating control is simplicity itself. Just suspend the cell on the cathode busbar (as you hang a rack of work), and daily spot checks are made with almost no time or effort. Adaptable to any type of still or automatic plating, the Hanging Hull Cell is invaluable in locating trouble through a sequence of operations. Test plates are the same size as used in the 1000 ml. Hull Cell and are available in either zinc plated steel or polished brass.

•

Meter—50 amperes, 4½" scale, 100% reversible (for reverse cleaners). Standard length—24" or 32" from hook center to cell bottom. (Other lengths on special order.) Hook size—Hook furnished for work rod up to 1½" in diameter.

R.O.H.C.

R. O. HULL & COMPANY, INC.
1302 Parsons Court
Rocky River 16, Ohio

R. O. HULL & COMPANY, INC.
1302 Parsons Court
Rocky River 16, Ohio

☐ Please enter our order for ..... Hanging Hull Cell(s) 24 (or 32 inch) length complete with 100 zinc plated steel, 10 polished brass panels and instructions at $97.00 each f.o.b. Rocky River, Ohio.

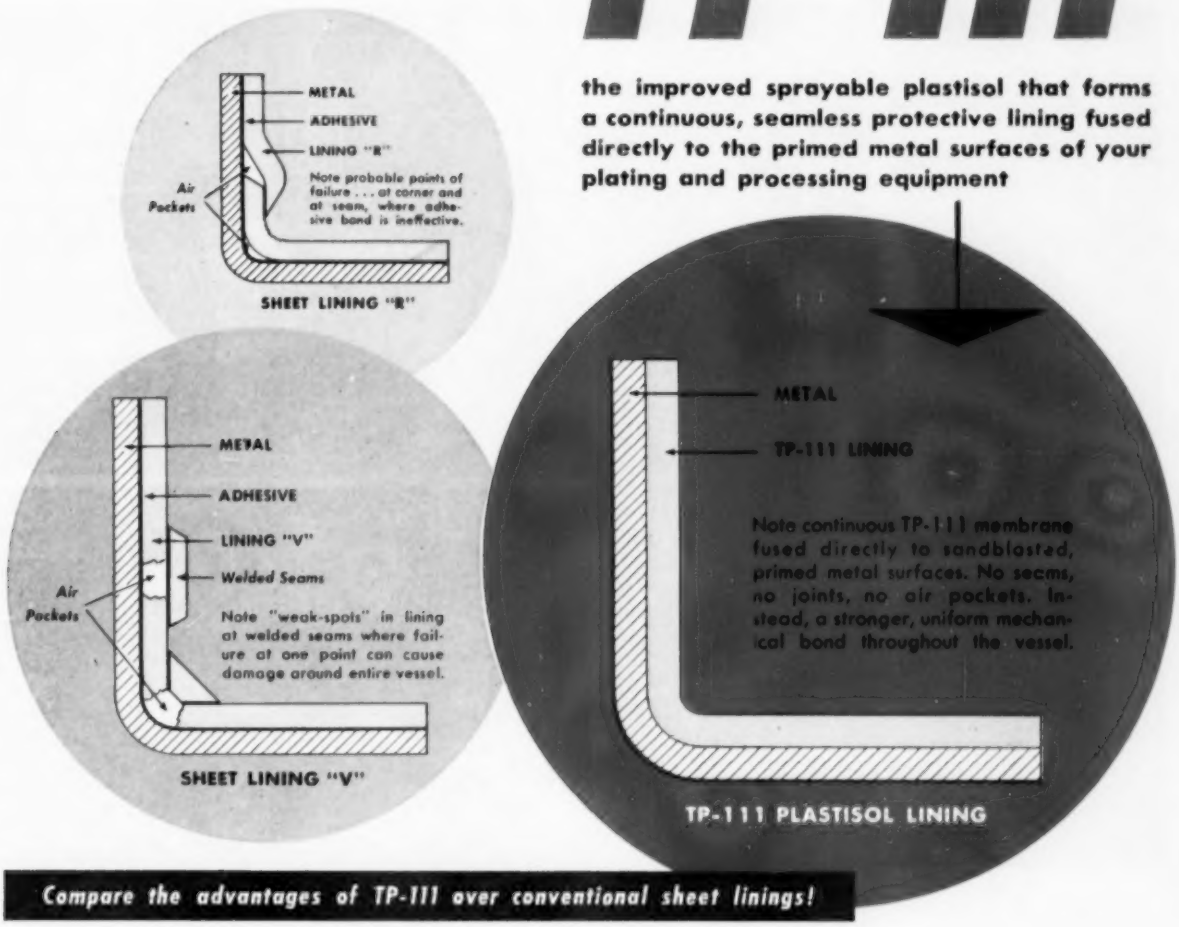
Name ..... Title .....
Company .....
Street Address .....
City ..... Zone ..... State .....

☐ Have your representative call to demonstrate the Hanging Hull Cell in our production baths.

***For positive protection* against chemical attack, specify**

A and P FINISHING TP-111

the improved sprayable plastisol that forms a continuous, seamless protective lining fused directly to the primed metal surfaces of your plating and processing equipment


METAL
ADHESIVE
LINING "R"
Air Pockets
Note probable points of failure . . . at corner and at seam, where adhesive bond is ineffective.
SHEET LINING "R"
METAL
ADHESIVE
LINING "V"
Welded Seams
Air Pockets
Note "weak-spots" in lining at welded seams where failure at one point can cause damage around entire vessel.
SHEET LINING "V"
METAL
TP-111 LINING
Note continuous TP-111 membrane fused directly to sandblasted, primed metal surfaces. No seams, no joints, no air pockets. Instead, a stronger, uniform mechanical bond throughout the vessel.
TP-111 PLASTISOL LINING

Compare the advantages of TP-111 over conventional sheet linings!

● **CONTINUOUS MEMBRANE**—As applied by A & P Finishing specialists, TP-111 forms a continuous membrane lining completely free of the joints, seams, and air pockets normally found in conventional sheet linings. Such breaks in a lining are generally considered weak spots where failure would permit liquid to flow to various parts of the vessel, causing extensive damage and loss of current density.

● **STRONGER BOND**—A & P Finishing TP-111 is fused directly to primed, sandblasted metal surfaces . . . thus effecting a stronger mechanical bond than that produced by adhesives used with conventional linings. This also permits use of TP-111 on higher temperature applications where adhesives are apt to soften causing a separation of the sheet lining from the base metal. Further, in the event of accidental damage to the TP-111 lining, chemical attack and undercutting is localized.

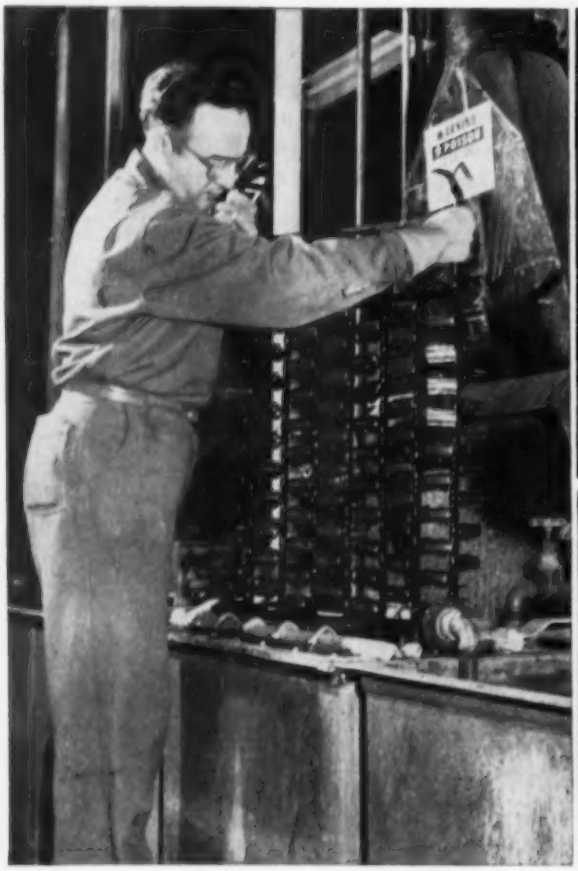
● **CONTROLLED HARDNESS**—The film hardness of TP-111 can be controlled to meet individual job requirements by A & P Finishing specialists. In addition, greater chemical and abrasion resistance can be effected through formulation and curing techniques which produce an unusually dense and durable membrane.

* ***POSITIVE PROTECTION*** — Protective linings are only as effective as the method by which they are applied. That's why it pays to insist upon proven A & P Finishing TP-111 linings as installed in our plant by workmen recognized as pioneers in this field. All work guaranteed and surprisingly low in cost. Available, too, through equipment manufacturers and plating jobbers. Write for details today!

A and P FINISHING AND MANUFACTURING CO.

17760 CLARANN AVENUE
MELVINDALE (Detroit) MICHIGAN
Telephone WArwick 8-7515

Appliance manufacturer saves time and money by using Koppers Potassium Cyanide Solution



About a year ago, a large mid-western appliance manufacturer discontinued the use of potassium cyanide in solid form for their electroplating process, and began using Koppers Potassium Cyanide Solution. They did this for two reasons: (1) to effect an actual cost savings, and (2) because they found that potassium cyanide in solution form is easier to handle. The physical effort of dumping and shoveling cyanide "eggs" is no longer necessary. The cyanide solution is simply drawn out of a drum.

Koppers Potassium Solution (35-40%) completely eliminates the dissolving step in your electroplating operation. It is available in 55-gallon drums which may be cleaned by a simple water wash. Or it can be delivered to you by tank car, and pumped directly into your storage tank, ready to use. For further information, write to:

KOPPERS COMPANY, INC.
Chemical Division, Dept. P-85
Pittsburgh 19, Pennsylvania

KOPPERS®

Koppers Chemicals

SALES OFFICES: NEW YORK • BOSTON • PHILADELPHIA • ATLANTA
CHICAGO • DETROIT • LOS ANGELES • HOUSTON

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 827.

BULLETIN DC-102

For every

DC electrical

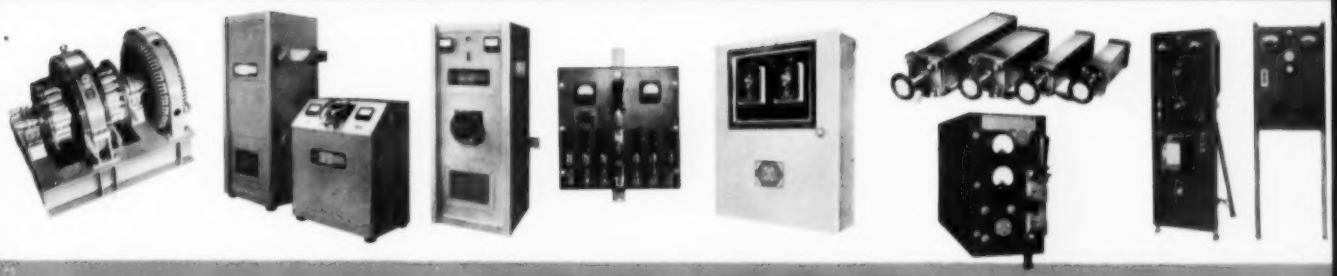
requirement in

metal finishing...

H-VW-M

The *only* manufacturer with a *complete* line of

GENERATORS
SELENIUM RECTIFIERS
GERMANIUM RECTIFIERS
RHEOSTATS



PR CONTROLLERS
SPECIAL PANELS

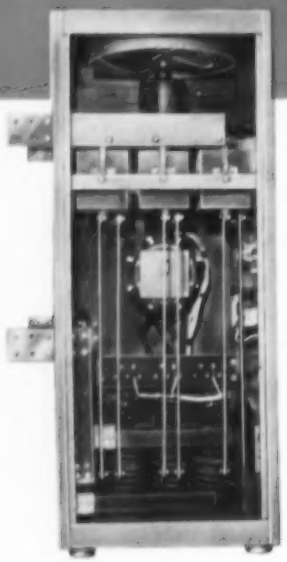
HANSON-VAN WINKLE-MUNNING COMPANY
MATAWAN, NEW JERSEY

Manufacturers of a complete line of electroplating and polishing processes, equipment and supplies
***Plants:* Matawan, New Jersey • Grand Rapids, Michigan**

Sales Offices: Anderson (Ind.) • Baltimore • Beloit (Wisc.) • Boston • Bridgeport
Chicago • Cleveland • Dayton • Detroit • Grand Rapids • Los Angeles • Louisville
Matawan • Milwaukee • New York • Philadelphia • Pittsburgh • Plainfield (N. J.)
Rochester • St. Louis • San Francisco • Springfield (Mass.) • Utica • Wallingford (Conn.)

H-VW-M Rectifiers

a complete line for



Only H-VW-M manufactures both of these thoroughly dependable sources of direct current for electroplating and allied processes. With a complete line of generators *and* rectifiers, H-VW-M, exclusively, is in a position to give unbiased recommendations for the *right* units for your installation. Here is the complete H-VW-M line—a generator or rectifier for every low-voltage electrolytic application.

H-VW-M RECTIFIERS

Selenium Rectifiers

High quality, economy, and safe, simple operation—that's a capsule description of the H-VW-M Selenium Rectifier—the finest ever designed for metal finishing. Outstanding design and construction features provide high efficiency, low maintenance, flexibility, and economy along with a high power factor and low ripple, all contributing to insure top operating performance in a wide range of applications. Here are the features so important to dependable current rectification.

Greater effective selenium plate area per ampere—Limits rise in stack temperature and increases efficiency and life expectancy.

Adaptability — The auto-transformer in regular units can be used for either 220 or 440 volt input.

Corrosion protection — Special fungus and moisture proof coating guards against deterioration of stacks and transformers.

Oversize transformers—Heavy duty for continuous operation.

Transformer compensating taps — On the main transformer, compensation corrects for normal aging of stacks.

Electrically balanced selenium plates —Only electrically indentical plates are assembled into same stack assuring long stack life.

Electrical protection — Complete overcurrent and under voltage protection. Calibrated thermostats protect stacks from over heating.

Forced air cooling — Strong updraft induced by oversized fan driven by ¼ HP totally enclosed motor with sealed lubrication.

Dual voltage output — Many units provide four output terminals to permit selection of two output voltages.

For complete information on H-VW-M Selenium Rectifiers, ask for Bulletin ER-107.

Germanium Rectifiers

One of the most important contributions to the electroplating industry in years, the H-VW-M low voltage Germanium Rectifier provides new levels of electrical efficiency and vastly improved voltage regulation. It is the latest addition to the broad line of H-VW-M low voltage, direct current power equipment. Here's why this development is big news to metal finishers—why its introduction means new economies in low voltage, high current rectification.

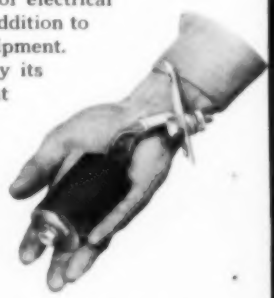
Dual-Output Remote Controlled Unit

Outstanding Efficiency and Voltage Regulation—Better than 90% efficiencies at full load result from low forward and high reverse resistance, and low voltage drop across the junction. Voltage regulation of ±5% or better from no load to full load.

Controls—Either ganged tap switch, 21-step voltage control from zero to rated voltage, or oil-immersed continuously variable auto-transformer control with push-button control to provide complete ease of operation.

Cooling—Same efficient fan-driven cooling system as in selenium rectifier line adds safety and durability to the unit.

Electrical Protection—Safeguarded from overloads and severe DC line shorts by simple replaceable, link-type fuses in output circuit, thermal overload switch over junctions, and magnetic contactor.

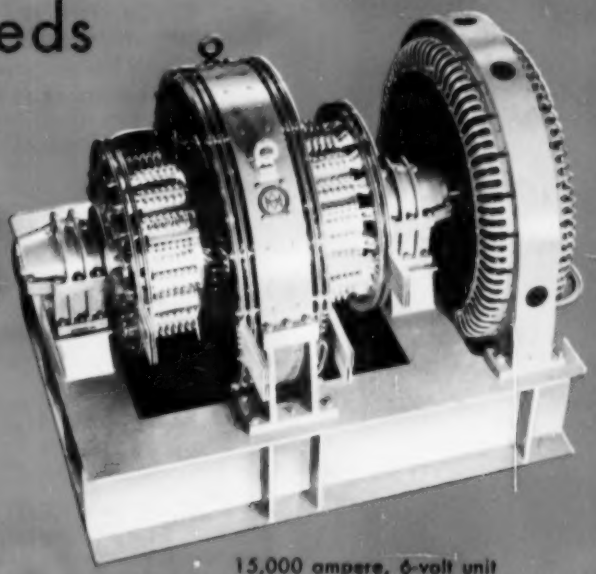


Compact germanium junction, core of new unit. Voltage range is from 12 to 48v, current output from 1000 to 10,000 amps.

For further information on H-VW-M Germanium Rectifiers, ask for Bulletin GR-100.

and Generators

all electroplating needs



15,000 ampere, 6-volt unit

H-VW-M MOTOR GENERATOR SETS

H-VW-M Motor Generator Sets not only *meet* specifications . . . but continually make *new* standards for voltage regulation, power factor correction, overload capacity, and exceptionally long and efficient life. H-VW-M Generators are built *to prevent selective action* and are *guaranteed* to be correct both mechanically and electrically. These precision-built producers of low-voltage direct current are available in a full range of sizes for every power need in electroplating and allied processes. Standard voltage ratings: 6, 9, 12, 15, 18, 25, 30, 40 and 50 volts. H-VW-M Generator Sets have *all* these outstanding advantages for the most economical production of current for metal finishing operations—

BRUSHES—COPPER GRAPHITE CONSTRUCTION—by using only flaked copper particles, ball-mill hammered, all H-VW-M brushes have a special grain structure which presents a minimum of resistance in the direction of useful current flow while offering *four times the resistance* to parasitical circulating currents.

MOLDED-IN SHUNTS—Specially-calibrated cables are molded into permanent and indestructible low-loss electrical contact with the body of the brush.

EQUALOAD SHUNTS—*prevent selective action.* By taking advantage of the thermo-electrical characteristics of a special alloy, closely calibrated H-VW-M Equaload shunts *automatically* regulate current flow, equalize current distribution, prevent brush overloads, cure selective commutation.

BRUSH HOLDERS AND RIGGING—Brush holders of one-piece cast bronze, accurately broached for proper brush fit, are rigidly supported and insulated from the electrical circuit.

Plated-steel torsion springs apply pressure to brushes through bronze fingers and no current can flow through the *springs* or the fingers to destroy their effectiveness.

BRUSH HOLDER SUPPORTS—Brush holders are supported from one end, allowing the maximum degree of accessibility to the commutator surface for cooling and maintenance. Provisions are made for radial brush holder adjustment after years of commutator wear.

COMMUTATOR RISERS—Designed to give fan action, risers provide more than adequate ventilation for commutator and field coils.

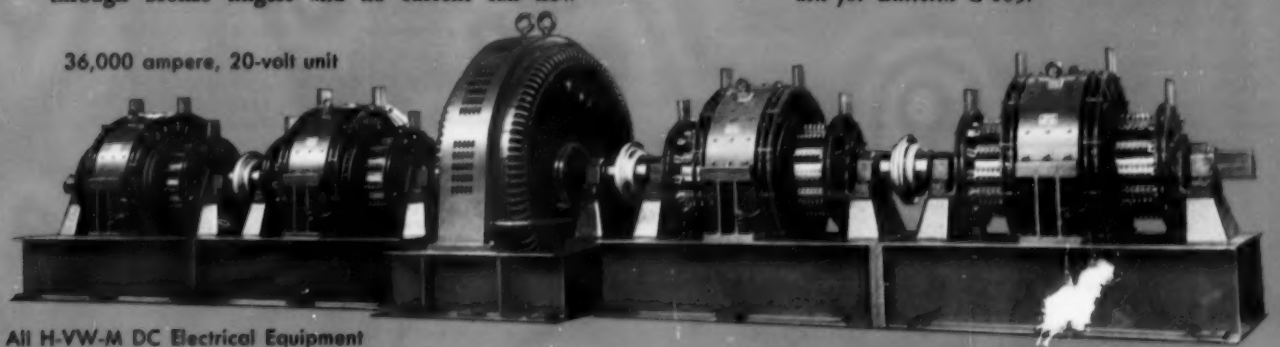
ROLLED-STEEL RING SET WITHIN FRAME—Provides a firmer base, minimizes vibration by lowering center of gravity of entire generator.

SLEEVE BEARINGS—Liberal size, sleeve-type bearings guarantee long, trouble-free life and quiet operation. Split construction used in larger sizes.

ROLLED-STEEL RING—Provides a more efficient conductor of magnetic flux than *any* casting.

For complete information on H-VW-M Generators ask for Bulletin G-103.

36,000 ampere, 20-volt unit



All H-VW-M DC Electrical Equipment is a result of

PLATEMANSHIP

H-VW-M's unique combination of: the most modern and complete laboratory for testing and development . . . the ability to provide complete equipment and supplies for every plating and polishing need . . . the complete background of knowledge and experience in every aspect of plating, polishing, cleaning and anodizing.

AND FOR OTHER DC APPLICATIONS...

Type "R"

H-VW-M PR CONTROLLERS—for periodic reversal of direct current for the H-VW-M PR and Wes-X Bright Copper Process and similar processes.

Type "R"—for reversing fields of a single generator.

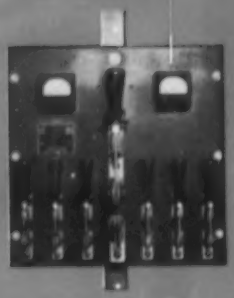
Type "RM"—for reversing fields of 2 or 3 generators simultaneously.

Type "RS"—a sub-controller, same Type "RM" except no timers.

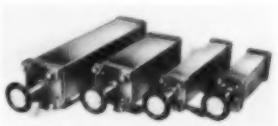
Type "RL"—for line reversal with rectifiers or single tanks on branch circuits.

Write for complete information.

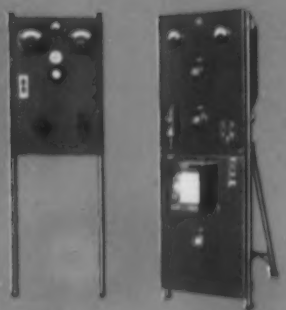
Type "RMH"
(special heavy duty Type "RM")



H-VW-M TANK RHEOSTATS—Furnish desired current density for plating by introducing a definite voltage drop between main lines and tank rods to produce the required voltage between anode and cathode. Standard ampere ratings from 30 to 1000 amperes (larger sizes to 5000 amperes on special order). *Ask for Bulletin TRA-527.*



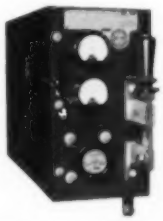
H-VW-M CARBON PILE RHEOSTATS—For precise stepless control on DC circuits. Rated from 25 to 250 amps. on continuous service; resistance range up to 50 to 1. *Ask for Bulletin CPR-100.*



Standard Generator Control Panel

Automatic Anodizing Control Panel

H-VW-M SPECIAL PANELS—Standard control equipment includes: DC Voltmeter; DC Ammeter with separate shunt; generator field rheostat; exciter field rheostat (or resistor); DPST field switch with discharge resistance (when required); start-stop push-button station for motor starter; motor field resistor and motor field ammeter (on synch. motor-driven sets only). Full line of auxiliary equipment available. *Send for Bulletin G-103.*



H-VW-M UNIVERSAL CARBON PILE TANK RHEOSTATS—Combine stepless, infinite control characteristics of carbon pile rheostat with adjustable nickel-chromium resistor. Combination provides ALL tank voltages for a specified line voltage and maximum amperage condition. *Send for Bulletin CPR-200.*

Engineered **A COMPLETE LINE OF ELECTROPLATING AND POLISHING PROCESSES, EQUIPMENT & SUPPLIES**

H-VW-M PRODUCTS AND PROCESSES

Abrasives
Acid Pump
Ammeters
Analyses, Solutions
Anodes
Anode Bags
Anode Containers, Ball
Aprons, Platers'
Balls, Steel Eclipse
Barrels, Burnishing
Barrels, Tumbling
Barrels, Plating
Barrels, (Portable Burnisher and Dryers)
Basket, Scrap Anode
Baskets, Dipping
Brighteners, Addition Agents
Brushes
Brush Units (Helical)
Buffs
Cathode Rockers
Chemicals, Plating
Chrome Spray Floats
Chrom-Ro Anodes
Cleaners—and Solvents
Compounds
Conveyors, Full Automatic
Conveyors, Semi-Automatic
Conveyors, Skip-Stop
Cooling Coils
Crocks, Earthenware
Degreasing Solvents
Dryers
Exhaust Fans
Filters
Felt
Fluxes
Generators
Gloves, Platers'
Glue, Belgrade
Heaters
Heating Coils
Hose
Insulating Steam Joints
Klinch Grain Cement & Thinner
Kote-Masq
Kote-Rax, Grade M
Lathes
Lime
Moisture Extractor Equipment
Pails, Rubber
Paint, Tygon Plastic
Periodic Reverse Control
Pipe & Fittings, BN
Purification Supplies
Rectifiers, Germanium
Rectifiers, Selenium
Rheostats, Carbon Pile
Rheostats, Tank
Rheostats, Universal Carbon Pile
Salt Fog Corrosion Testing Equip.
Sisalin Sections
Bias Sisalweev Sections
Standard Plating Solutions
Tank Rheostats
Tanks
Temperature Controllers
Triclene "D"
Voltmeters
Wheels, Polishing
Wrap-Rax Tape
Continuous Strip and Wire Cleaning, Plating and Pickling Lines

HANSON-VAN WINKLE-MUNNING CO. · MATAWAN, NEW JERSEY, U.S.A.

H-VW-M

HANSON-VAN WINKLE-MUNNING COMPANY, MATAWAN, N. J.

PLANTS: MATAWAN, N. J. • GRAND RAPIDS, MICHIGAN

SALES OFFICES: ANDERSON (IND.) • BALTIMORE • BELOIT (WISC.) • BOSTON • BRIDGEPORT CHICAGO • CLEVELAND • DAYTON • DETROIT • GRAND RAPIDS • LOS ANGELES LOUISVILLE • MATAWAN • MILWAUKEE • NEW YORK • PHILADELPHIA • PITTSBURGH PLAINFIELD (N. J.) • ROCHESTER • ST. LOUIS • SAN FRANCSCO • SPRINGFIELD (MASS.) UTICA • WALLINGFORD (CONN.)

Printed in U.S.A.

INDUSTRY'S WORKSHOP FOR THE FINEST IN PLATING AND POLISHING PROCESSES • EQUIPMENT • SUPPLIES

REPORTS from all over

. . . stripped, cleaned and degreased

(This section is especially compiled for the readers of PLATING; here the world in which we work and operate is stripped of its veneer, cleansed of its distortions and carefully degreased of superfluities).

Chemical Abstracts has increased from 2,000 pages in 1947 to 10,000 in 1955. Its price has risen from $20 per year for members and $350 per year to all other individuals. These facts indicate how rapidly the amount of published technical literature is increasing and that costs are far out of proportion to subscription income. . . . According to S. Feuchtwanger, Commercial Discount Corp., the recent mergers and buy-outs in the chemical field stem from a combination of rapid growth and tight working capital. This absorption of smaller firms by larger corporations is held to be "unfortunate for the economy because smaller firms provide flexibility and marketing ability which is usually lost when merged with a giant corporation."

Quotations on all metals stand:

ALUMINUM—(99 per cent pure plus ingot)	23.200
ANTIMONY—Five tons or more but less than carload	31.970
Bulk	28.500
In cases (Port Laredo)	29.000
CADMIUM—Producers' quotation	170.000
Producers' and platers' quotation	170.000
Platers' quotation	170.000
COPPER—Electrolytic, domestic	35.700
Electrolytic, export	36.339
GOLD—(per ounce U. S. price)	$35.000
LEAD—Common, New York	15.000
Common, St. Louis	14.800
MAGNESIUM—(ingot)	28.500
MERCURY—(per 76 lb flask)	$283.269
NICKEL—(F.O.B. Port Colborne U. S. duty included)	64.500
PLATINUM—(refined per oz)	$79.077
SILVER—New York, per/ounce	89.688
London, pence/oz	77.977
TIN—New York	93.625
New York, 99 per cent min	92.625
ZINC—Prime Western (E St. L.)	12.232
Prime Western (delivered)	12.732

WATER AND WASTE TREATMENT—A simple technique has been developed and a cost comparable to other softening methods. It is an anionic softening with strong base anion exchange resins. Quaternary anion exchangers can be used. . . . Perhaps eventually it will be best to seed industrial wastes with the biota of sewage according to J. Lackey. . . . New polymeric polyelectrolytes developed by *Cyrus Wm. Rice and Co.* for industrial water treatment are claimed to increase the rate of floc growth and settling time by 4 to 10 times over those possible without polyelectrolyte addition. The floc produced has greater strength and greater resistance to redispersion by excessive turbulence. . . . An Army Engineers report by OTS, Dept. of Commerce, claims that scale in sea water evaporators can be controlled and production maintained indefinitely by descaling with citric acid. Immediate descaling with citric acid in hot brine is said to return the machine to operation within an hour. Use of citric acid reportedly increased production by twenty times with runs up to 10,000 hours without descaling. . . . The Interior Department's research program on making fresh water from sea water will be intensified and expanded as a result of the Congressional appropriation being raised to $10 million.

METALS—*Alloy Surfaces Co.* claims its method of diffusing chromium into ferrous metals forms a stainless surface alloy which resists corrosion under severe atmospheric, water and chemical corrosion conditions. A stainless alloy is formed in the surface to a depth of 0.001–0.008 inch without causing dimensional changes. Stretching or twisting the processed metal is claimed not to crack or chip the surface, and products can be welded before or after processing. . . . In preparing metal surfaces for painting by rinsing the previously phosphated surfaces with high-strength solutions of chromic and chromic-phosphoric acid, the chromic acid rinse solution is said to give better results at room temperature than when the solution is steam heated to 165° F.

READER SERVICE CARD

August 1955. Do not use after October 15, 1955

Please send me information on the following—

Ads: A..... A..... A..... A.....

E. and S.: E..... E..... E..... E.....

Tr. Lit.: L..... L..... L..... L.....

Name.....Position or Title.....

Company Address.....

City.....Zone.....State.....

(INQUIRIES FORWARDED PROMPTLY TO PROPER SOURCE)

First Class Permit No. 4032, Sec. 34.9, P. L. & R. Newark, N. J.

BUSINESS REPLY CARD
No Postage Stamp Necessary if Mailed in the United States

Postage Will be Paid by Addressee

AMERICAN ELECTROPLATERS' SOCIETY
445 BROAD STREET
NEWARK 2, NEW JERSEY

First Class Permit
No. 4032,
Sec. 34.9,
P. L. & R.
Newark, N. J.

Postage
Will be Paid
by
Addressee

BUSINESS REPLY CARD
No Postage Stamp Necessary if Mailed in the United States

PLATING
445 BROAD STREET
NEWARK 2, NEW JERSEY

Attn.: Reader Service Department

Please send me the followings: (Encircle Serial No.)
For Books and Binders Please Enclose Remittance with Order

BINDER	A 165-53	B 142-53	A 219-51T	B 183-49	B 253-53
BOOKLET	A 166-53T	B 200-53T	B 117-49T	B-242-53	B-254-53
A 164-53	B 141-45	B 201-49T	B 177-49	B-252-53	B 281-53T

(USE THIS CARD FOR ORDERING
ASTM—AES SPECS & STANDARDS, BOOKS AND COVERS)

Name.....

Address.....

City.....Zone.....State.....

SPECIFICATIONS and TESTS for ELECTRODEPOSITED METALLIC COATINGS*

FREE FOR THE ASKING
USE Reader's Service Card

STANDARDS RELATING TO ELECTRODEPOSITED METALLIC COATINGS

Specifications for:

A 164-53.	Electrodeposited Coatings of Zinc on Steel
A 165-53.	Electrodeposited Coatings of Cadmium on Steel
A 166-53 T.	Electrodeposited Coatings of Nickel and Chromium on Steel (Tentative)
B 141-45.	Electrodeposited Coatings of Nickel and Chromium on Copper and Copper-Base Alloys
B 142-53.	Electrodeposited Coatings of Nickel and Chromium on Zinc and Zinc-Base Alloys
B 200-53 T.	Electrodeposited Coatings of Lead on Steel (Tentative)
B 201-49 T.	Chromate Finishes on Electrodeposited Zinc, Hot-Dipped Galvanized, and Zinc Die-Cast Surfaces (Tentative)

Methods of:

A 219-51 T.	Local Thickness of Electrodeposited Coatings, Test for (Tentative)
B 117-49 T.	Salt Spray (Fog) Testing (Tentative)

Recommended Practices for:

B 177-49.	Chromium Plating on Steel for Engineering Use
B 183-49.	Low-Carbon Steel for Electroplating, Preparation of
B 242-53.	High-Carbon Steel for Electroplating, Preparation of
B 252-53.	Zinc-Base Die Castings for Electroplating, Preparation of
B 253-53.	Aluminum Alloys, Preparation of and Electroplating on
B 254-53.	Stainless Steel, Preparation of and Electroplating on
B 281-53 T.	Copper and Copper-Base Alloys for Electroplating, Preparation of (Tentative)

**Sponsored by ASTM and AES*

FOR YOUR AES LIBRARY

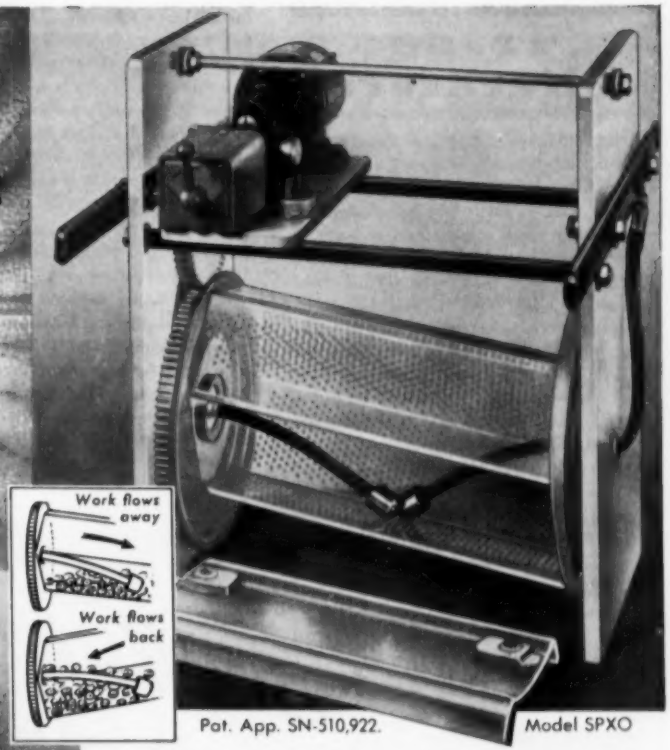
To give clean permanence to your copies of PLATING, this attractive, hard-covered binder is perfect. It has the AES emblem embossed in gold leaf on its back as well as the name and the year. (Please indicate year wanted).

$3.00 in U. S. A. — $4.00 Canada & Foreign
(add .70 for firm name)

An AES sponsored Research Project is brought together in this soft-bound saddle-stitched booklet. Here are all the results of the study in an easily usable form.

$ .75 to AES members
$1.00 to non-members

Startling BREATH-TAKING REVOLUTIONARY



Pat. App. SN-510,922.

Model SPXO

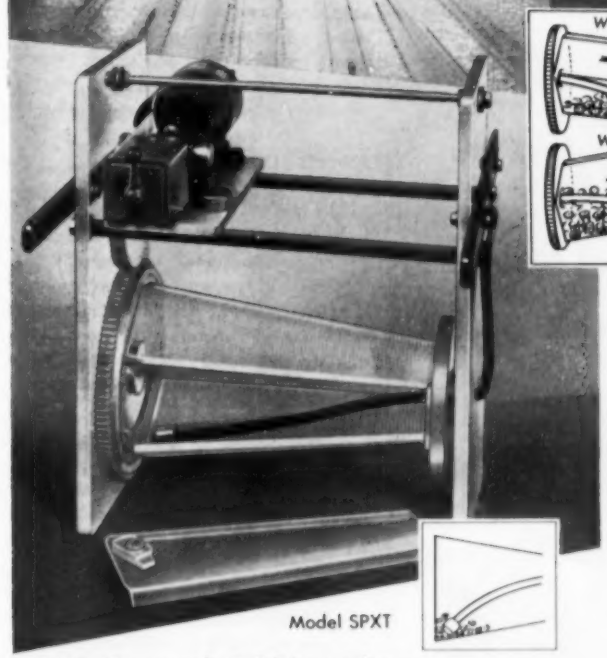
BELKE Double Oscillating Cylinder

Affords uniformity of deposit never before obtainable in barrel plating.

Eccentrically mounted cylinder oscillates as it rotates. Moves the work back and forth *across* the cylinder. No parts remain shielded by cylinder ends. All parts exposed for plating so uniform you can deposit specified thickness in a fraction of the time formerly required.

A tremendous money saver for all barrel plating. An absolute must for washers and flat pieces that tend to stick together.

All sizes from 14 x 30 regulars to 6 x 12 portables.



Model SPXT

BELKE Tapered Odd-Lot Plater

Plates from a few pieces to full capacity

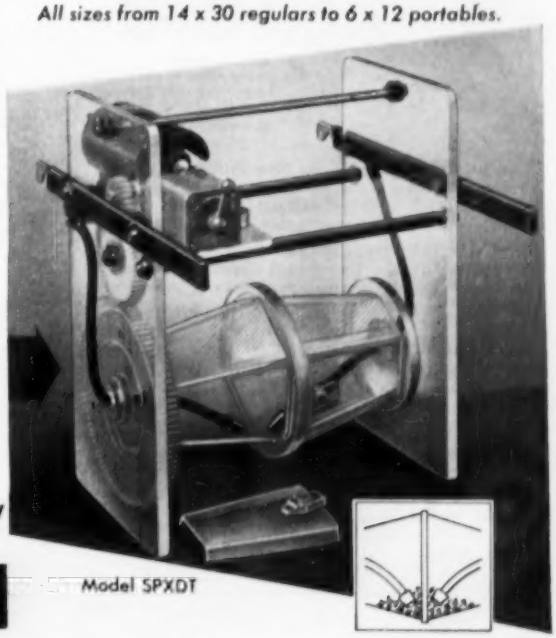
Eliminates costly hand wiring *heretofore unavoidable in plating small quantities.*

Tapered Lucite cylinder *piles the work at the deep end around the ball contact.* Assures uniform plating of any quantity from a few pieces to a full load.

BELKE Double Tapered Odd-Lot Plater

Plates odd lots of two kinds of work.

Double tapered, two-compartment Lucite cylinder piles each kind of work around a ball contact. *Assures uniform plating in each compartment of any quantity from a few pieces to a full load.*



Model SPXDT

Belke Manufacturing Company
947 N. Cicero Ave., Chicago 51

EVERYTHING FOR PLATING PLANTS

Trade Literature

L—809. Molded Rubber Goods and Industrial Sheet Packing Catalog Issued by Hewitt-Robins, Inc. The molded rubber goods section contains a specification chart comparing the qualities of six types of natural and synthetic rubber used by the company in the manufacture of molded products for original equipment manufacturers. Also included in this section is a check-sheet type of form for readers desiring engineering assistance on special problems. The company produces molded rubber goods only to the specific requirements of original equipment manufacturers.

▸ The industrial sheet packing section lists 10 types of all-purpose pure gum and synthetic rubber sheet packing and the recommended uses for each. The catalog points out that these all-purpose packings permit a gasket cutter or processor to stock relatively few items to gain coverage for many types of finished products. Included in this section is a chart showing the hardness, tensile strength, elongation, approximate weight, and standard width of each item.

L—810. New Products List Issued by Acheson Colloids—A revised 4-page booklet, listing 44 colloidal and semi-colloidal dispersions for the metalworking, foundry, and related industries, has just been issued by Acheson Colloids Co. These products include dispersions of graphite, molybdenum disulfide, mica, vermiculite, zinc oxide, and acetylene black. Carriers and diluents are given for each product, along with typical applications and important physical data.

Eight entirely new dispersions have been added to this latest revision of Acheson's product list. These include such varied products as a corrosion-resistant coating for dry-film lubrication, an anti-seize compound for oxygen systems, and an improved interior wall coating for cathod-ray tubes.

L—811. Wall Chart on Handling Caustic Soda Safely—A helpful, handy wall chart giving 37 specific, successful suggestions based on accumulated plant experience for safely handling solid, liquid and flake caustic soda has just been issued by Diamond Alkali Company, Cleveland, Ohio.

The wall chart, 17 x 23 inches, is printed in two colors on coated linen stock tinned on top and bottom with metal eyelets for convenient hanging. It concisely presents safety recommendations covering first aid measures, protective practices and equipment, and dissolving and unloading procedures. Space is also provided for listing telephone numbers for emergency use.

L—812. Ultrasonic Cleaning Equipment for Industry—The Acoustica Model DR-400 Ultrasonic Cleaning Equipment for production cleaning and degreasing of precision products, electroplating, soldering aluminum, degassing molten aluminum, metal cutting and many other applications in metalworking machinery, welding, and foundry shops is described in a new bulletin published by Acoustica Associates, Inc.

A photograph of the ruggedly constructed, portable one knob control unit, an explanation of its above-audibility sound wave principle of operation and complete specifications of the DR-400 are presented.

Also listed in the bulletin are a number of unusual, cost saving ultrasonic applications for machining hard materials, emulsifying immiscible liquids, descaling metals, cleaning and degreasing of watch parts, and many others.

L—813. Pangborn Announces Literature on Centrifugal Wet Dust Collector—Foundrymen, chemical engineers, metallurgists, plant engineers, safety engineers and those faced with the problem of control of hot or moist, explosive or combustible, corrosive, abrasive or obnoxious dusts will be interested in the new 4-page bulletin (No. 919) announced by the Pangborn Corporation, Hagerstown, Md., describing the type "CW-1" centrifugal wet dust collector. Five photographs, three line drawings and two tables give complete data on the Pangborn counter-current, wet collector of tower construction. The action of the patented vanes in dispersing the liquid to obtain greater capacity in reduced space is described.

Why it pays to SPIN-DRY plated work—small lacquered parts

Choose from 3 carefully engineered models . . .

1. **Standard Model.** Takes nearly every type of part. Built for long, trouble-free service. J. I. C. and N. E. C. controls also available.

Saves time . . . With the New Holland Kreider Dryer operating at 625 r.p.m. on only ¾ h.p. you can *spin-dry* a basket of parts (1140 cu. ins.) in as little as 35 seconds—no more than 2 minutes.

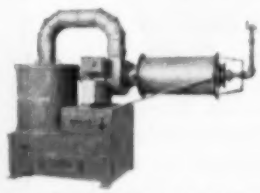
Improves quality. . . With a New Holland Kreider Dryer, high speed centrifugal spin-drying eliminates scarring and marring, assures smooth, evenly dried surfaces, with longer lasting luster . . . fewer "rejects."

Cuts costs . . . What's more, though a New Holland Kreider Dryer occupies less than 6 sq. ft. of floor space, it's a big money saver. Power costs are low, production high—with little or no maintenance over the years. And one man can operate it, easily, efficiently.

See for yourself. Write Department PT-855 today for illustrated 4-page folder.

New Holland Machine Co., New Holland, Pa.

2. **With Auxiliary Steam Heating Unit.** Used for small parts that hold moisture—lacquered parts—or where cold water rinse is used. Shown with J.I.C. control—N.E.C. control also available.

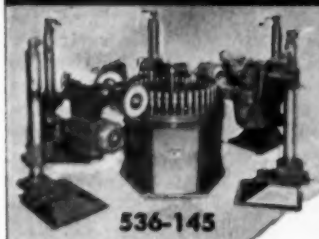


3. **With Auxiliary Gas Heating Unit.** Used for small parts. Caution: Do not use with inflammable materials.

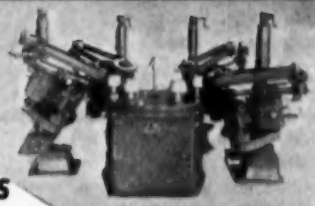
NEW HOLLAND KREIDER DRYER

ACME *Rotary Automatics*

...cut costs on production finishing



536-145



512-9-2

ROTARY TABLES ARE AVAILABLE IN SIZES UP TO 24 FT. DIAMETER

534-337

ACME 8 FT. *Combination Type* ROTARY AUTOMATIC

● This machine can be readily changed from a 32 spindle continuous rotary automatic to an 8 station indexing rotary automatic by simple hand crank adjustment. Various types of ACME adjustable floating head polishing and buffing lathes are used including belt arm attachments on buffing heads, utilizing the same heads for buffing or belt operations. Spindle arrangements are available in multiples of 8.

Rotary Catalog on Request.

536-149

RECOMMENDATIONS and QUOTATIONS . . . will be offered on receipt of blue prints or preferably finished and unfinished parts you contemplate finishing, together with details of your present finishing operations and production requirements.

SPECIAL MACHINERY AUTOMATIC BUFFING MACHINES

ACME *Manufacturing Co.*

Builders OF AUTOMATIC POLISHING AND BUFFING MACHINES FOR NEARLY HALF A CENTURY

1400 E. 9 MILE RD., DETROIT 20 (Ferndale) MICH.

Trade Literature

L—814. Flexible Hose Bulletins—The Flexaust Co., N. Y. announce the availability of a complete set of new bulletins (Nos. 40, 41, 42, 43, 44 and Price Lists).

These bulletins give information on the design, installation or purchase of flexible hose used in dust and fume control, air-conditioning and materials handling. They contain general information, accessories, installation, application, friction loss and other useful data.

L—815. Hydro-Finish Bulletin Offered by Pangborn Corporation—Pangborn Corporation, Hagerstown, Md., manufacturer of blast cleaning and dust control equipment has announced the availability of Bulletin No. 1403 on Hydro-Finish liquid blast cleaning equipment.

This new 8-page bulletin contains photographs, detailed drawings, dimensions, sizes and features of all models of the EZ-2 and EZ-3 machines. The EZ-2 unit is fitted with a circulating pump to handle the slurry. In the new EZ-3 machines the pump has been replaced by Pangborn Slurinators, which are air escapement units located at the sides of the hopper near the bottom.

The Hydro-Finish process is especially useful in solving cleaning problems such as deburring, surface finishing and lubrication control, surface preparation for coating, dye and mold maintenance, and general maintenance.

L—816. New Diamond Booklet—Graphically depicting in word and picture its family of chemical products for industry and agriculture, Diamond Alkali Company, Cleveland, Ohio, has just published the fourth edition of "The Story of the Chemicals You Live By."

With the important contributions which Diamond Chemicals make to building a better America through chemical progress as its theme, this newly revised and enlarged, 24-page booklet paints in broad strokes a panoramic picture of these basic materials, their principal applications and their production in a way that is interesting and informative to both technical and nontechnical readers.

Liberally illustrated, the booklet narrates the story of how Diamond's "chemicals you live by" are essential to everyone's everyday existence.

Products or product-groups discussed briefly are soda ash, caustic soda, chlorinated methanes, bicarbonate of soda, sodium silicates, calcium carbonates, chromates, specialized chemicals, organic chemicals, plastics and agricultural chemicals.

L—817. Care of Septic Tank or Cesspool Booklet—A free eight-page illustrated booklet entitled, "The Story of Willie Bacteria, or How To Take Care of Your Septic Tank or Cesspool" has been made available to owners of septic tanks and cesspools by the Educational Division of the FX-Lab Company, Newark, N. J.

This booklet explains the workings of the septic tank and cesspool in simplified fashion using cartoon type illustrations. It describes the bacterial action of the disposal system and the nature of the bacteria contained therein which are responsible for the proper functioning of the system.

The focal point of the booklet centers around a humanized "Willie Bacteria" who is responsible for maintaining the efficiency of the household disposal system, but needs the cooperation of the entire "family" in carrying out his duties.

When the family ignores the fact that "Willie" is working to keep his "kingdom" and their home free from disease, and saturate him with an overdose of detergents, acids, lyes, caustics, and other irritants, he becomes very unhappy, and more often than not, just stops working.

But there is a bright side to the story too, for "Willie" has found a way to educate the septic tank-cesspool owner so that "Willie" can do his job under modern, up-to-date working conditions, and prevent the mess, fuss, inconvenience, and expense of a clogged system, described in the booklet.

Self Priming
Model LSIN-10
Cap. 100 gal/hr.
H. T. Lucite
Filter Assembly
Stainless steel
pump. Portable-
Wt. . . . 60 lbs.
14"x16"x16" ht.

filter 50-2400 GAL/HR Any Electroplating Solution

A model to fit your needs! . . .

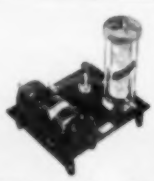
SERVICE . . . Filters practically any acid or alkaline solution from PH 0 to PH 14; removes particles down to one micron in size.

DESIGN . . . Filter Assemblies fabricated of stainless steel 316, H. T. Lucite, Rubber-lined steel, Haveg, Epoxy Resin, Rigid Vinyl, Polyethylene, Teflon, etc.... **Filter Tubes** of cotton, dynel, porous stone or porous carbon...

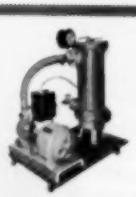
Pumps fabricated of Hastelloy, stainless 316 or plastic; centrifugal or self priming . . . **Motors**, totally enclosed, ball bearing, choice of current characteristics . . . **Hose** — special acid and alkali resistant . . .

Base — Linen impregnated phenolic laminate on rubber tire, ball bearing casters . . . **Automatic Controls** — on RLS models include magnetic starter, stainless visual bourdon gage and stainless pressure shut-off switch.

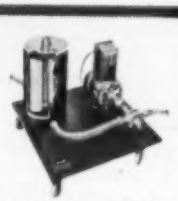
Models Centrifugal Pumps	Models Self Priming Pumps	Rated Capacity Gal./Hr.
LSI-5	LSIN-5	50 g/h
LSI-10	LSIN-10	100 "
ASI-300	ASIN-300	300-450 "
ASI-400	ASIN-400	400-600 "
ASI-600	ASIN-600	600-900 "
RLS-1200	RLSN-1200	1800 "
RLS-2400	RLSN-2400	2400 "



LSI-10 . . . Stainless Steel Centrifugal Pump. H. T. Lucite Filter Assembly.



RLSN-1200 . . . Stainless, Turbine Pump. Rubber-Lined Filter Assembly.



ASIN-300 . . . Self Priming, Stainless Pump. Epoxy Resin Filter Assembly.

Write for descriptive literature and information now!
Our Distributors in Principal Cities

Sethco MANUFACTURING COMPANY
72 Willoughby Street . . . Brooklyn 1, New York

Worth crowing about . . .

for ELECTROLYTIC CLEANING of STEEL and COPPER

New Improved AHCOLOID "200"

Non-dusting, low foaming, *improved* Ahcoloid 200 is safer and easier to use than conventional heavy duty cleaners. Special Ahcoloid agents control escape of gases generated during anodic or reverse current cleaning. There is never a spray or overflow of caustic solution.

New, improved Ahcoloid 200 is a free-flowing alkaline powder that quickly and thoroughly frees steel or copper surfaces from grease, oil, metal particles, carbon deposits, or residue from such operations as buffing, stamping, or grinding.

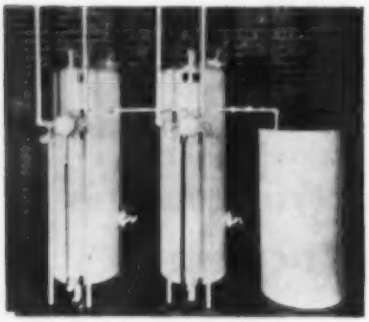
It will pay you to find out more about *new, improved* Ahcoloid 200, the heavy duty cleaner with extra penetrating, wetting, and emulsifying power.

For full details about *new, improved* Ahcoloid 200, write today to Apothecaries Hall Company, 22 Benedict Street, Waterbury, Connecticut.

Apothecaries Hall Co.

Equipment & Supplies

Please use Reader Service Card for all items in this section



Industrial Softeners

E—818. Small Zeolite Water Softeners—Industrial Filter and Pump Mfg. Co., Chicago, Ill. announce several new model zeolite water softeners. They are made in 13 standard sizes with flow rates from 6.5 to 40 gal/min. These flow rates will satisfy demands for small volumes of soft water in food and processing plants, commercial and institutional laundries, power plants, railroad locomotives, textile plants and for potable water supply.

These *Industrial* zeolite water softeners are of simple design for convenient operation through a single multiport valve. They can be supplied with either automatic or semi-automatic controls. In automatic operation, the steps of backwashing, brining, rinsing, and return to service are carried out automatically without operator's attention. With the semi-automatic operation, initiation of the regeneration cycle is controlled by push button.

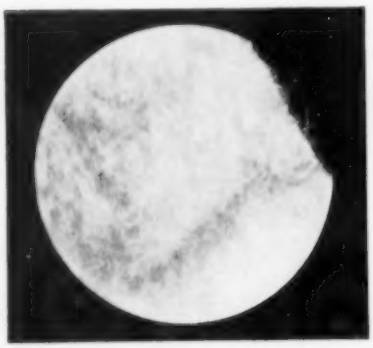
E—819. Super Netone Filter Paper—The National Filter Media Corporation, New Haven, Conn., announces a new neoprene impregnated filter paper with a wet bursting strength of 75 lb/sq in or more. This new paper shows good chemical resistance, is free flowing, economical, and in many applications it can replace cloth or extend cloth life. Super-Netone filter paper is available in several weights, plain or crepe finish.

E—820. Feon Dynel Filter Felt—A new Feon chemical-resistant synthetic filter felt, made of tightly compacted resin-bonded fibers of Dynel, has been announced by Filtration Fabrics Div. of Filtration Engineers Inc., Newark, N. J. Principal applications will be for pressure filters and centrifuges.

Feon Dynel is virtually unaffected by most concentrated mineral acids and bases, and is very highly resistant to a variety of organic acids, bases and salts. The new felt is easy to clean, and has a structure which retains fine solids yet has a relatively high porosity permitting high filtering rates.

In its manufacture, short fibers of Dynel are carded in both directions to give greater strength, dimensional stability, and smoothness. The fibers are treated with a resin binder. After felting, the bond is "set" under heat and pressure to give a dense, strong, smooth-surfaced filter cloth.

An advantage of Feon Dynel felt, according to Filtration Fabrics Div., is that the bonding resin is Vinyon—the same basic material as the Dynel, and will withstand any chemicals for which Dynel itself is suitable.



Synthetic Filter Felt

Feon Dynel felts have greater chemical resistance than previously available wool felts, do not shrink, and because they keep their shape they are easier to fit in the presses. Maximum temperature is 170° F. They can be sealed in press frames without rim cutting. These felts have bursting wet strengths of from 200-350 lb/sq in, which is more than required for filtering applications.

E—821. Demineralizer Features Ion Exchange Action with Completely Automatic Operation Including the Regeneration Cycle—The Penfield Manufacturing Company of Meriden, Conn., has announced the addition to its line of industrial demineralizing equipment of a new, completely automatic Mono-Column Demineralizer designed for users of 200 gph of super high purity water.

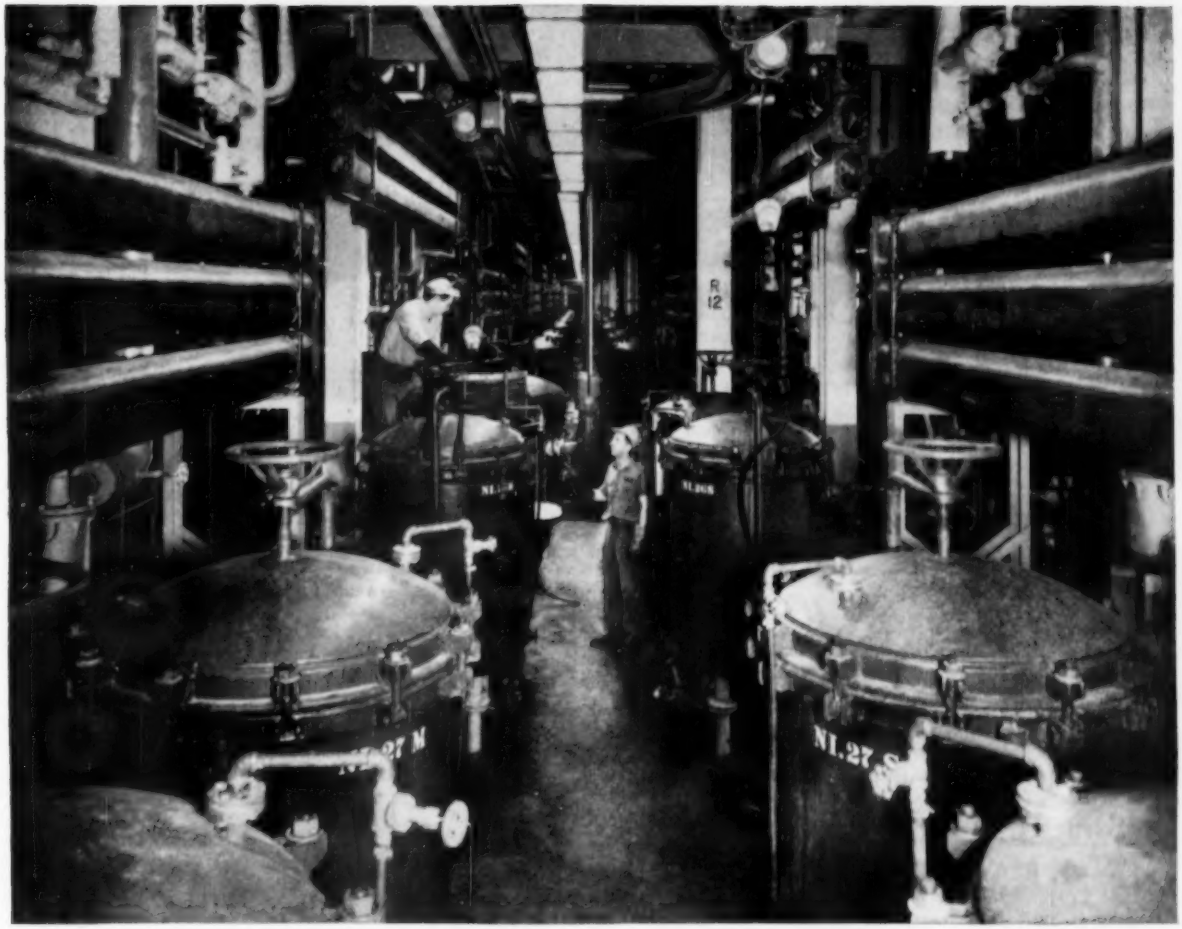
As shown in the picture, the new Penfield MA-200 Demineralizer is an exceptionally compact, completely packaged unit, requiring for its installation a minimum of floor space, connection of influent to a plant's water system, and connection of effluent to those points where high purity water is required (process, boiler feed, etc.).

Raw water enters the demineralizing unit at the influent and after passing only once through the mono-column of mixed cation and anion resins, is received at the effluent stripped of all its impurities. A flow meter on the influent enables setting water intake at an optimum rate for the most efficient ion exchange action, and a Penfield Electric Purity Meter, plus automatic controls, enable automatic control of the purity of the effluent.

Thus, once a Penfield MA-200 Demineralizer is installed, all operating functions, including the regeneration cycle, become completely automatic. There are no valves to operate and minimum supervision is required. Whenever the effluent's conductivity falls below standard, the treated water is automatically discharged and lights (or other warning system) signal the need for activation of a regeneration cycle.

The simple turn of a single switch then puts the unit through its regeneration cycle automatically, including rinsing and recutting in the effluent when desired resistivity (purity) is reached. During this automatic regeneration cycle, the regenerative tanks are automatically refilled with water so that fresh acid and caustics may be added in preparation for the next regeneration cycle.

Compact Demineralizer



48 Sparkler Horizontal Plate Filters in this installation

Why do the largest plating plants in the world Choose SPARKLER FILTERS?

The answer is simple, and obvious to plating engineers.

First — the cake on a Sparkler Horizontal plate filter will not crack or fall off with a variation in pressure or with a complete shut down of filtering. ***Second*** — dry cake disposal eliminates the sewer problem. ***Third*** — the quick-change plate assembly reduces the down time for cleaning each filter to a matter of minutes.

This is why many of the world's largest plating plants use Sparkler Filters exclusively.

Plating engineers can get full cooperation at Sparkler on any size installations.

SPARKLER MANUFACTURING CO., Mundelein, Ill.

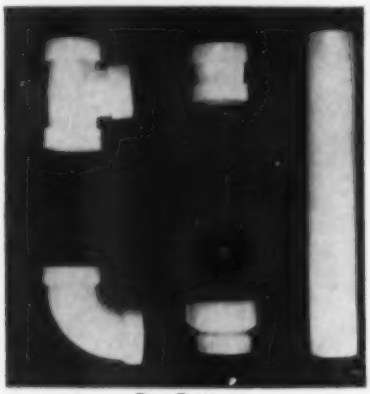
Filtration engineering and manufacturing has been our exclusive business for over 30 years

Manufacturing plants in Canada, Holland, Italy, Australia

Service representatives in principal cities throughout the world

Equipment & Supplies

E—822. Polyethylene Fittings and Pipe—Arthur S. LaPine & Company announces the addition of two complete lines of polyethylene fittings—a line of threaded fittings and a line of sleeve fittings. Each line includes elbow bends, short tees, swept



Fine Fittings

tees and swept bends. The threaded line also includes a half coupler with a male thread and a half coupler with a loose nut. There is also a blanked screw cap for cleaning. A stainless steel band clamp is available for connecting sleeve fittings.

E—823. Rigid PVC Handles Corrosives—Frequent, costly replacement of metallic pipe and fittings, and excessive maintenance required for circulating normal nickel plating solutions through four nickel plating tanks at the Bloomfield, N. J. plant of the Lamp Division, of the Westinghouse Electric Corp., created a need for improved corrosion-resistant pipe. The pipe required had to be highly resistant to a low *p*H nickel plating solution. Further, it had to carry this solution at 150° F operating temperature, at a rate of 200 gal/hr with low maintenance and simple installation.

To solve this problem, Alpha No. 101 Normal Impact Rigid PVC Pipe, consisting of 100 ft of ½ inch and 60 ft of 1½ inch pipe manufactured by Alpha Plastics Inc. West Orange, N. J., were supplied and installed in September 1954. Alpha No. 101 PVC Pipe carries the solutions to heat exchangers and return to the plating tanks, as well as through a No. 300 Titeflex Filter. End product of the nickel plating bath process is nickel-plated copper and iron for lamp lead-in wire and supports.

The result was satisfactory corrosion-resistant performance of Alpha Rigid PVC Pipe, after eight months use in its nickel plating process. A minimum of maintenance has been required, and the polyvinyl chloride pipe has effectively resisted the corrosive nickel plating solution, giving dependable service, with low maintenance.

Squeezable

E—824. Automatic Burette—A new automatic burette, designed to simplify laboratory work, has been announced by Meyer Scientific Supply Co., Inc., Brooklyn, N. Y. The new burette is supplied with a squeezable reservoir bottle for convenient burette filling with automatic finding of zero point.

The reservoir is attached to the burette by a heavy threaded polyethylene cap that eliminates breakage due to the forcing of rubber stoppers in bottle necks.

Royalton Press-O-Matic Burettes are supplied with 0.1 ml graduated intervals; 10 ml burettes are supplied with 500 ml bottles, and 25 ml burettes are supplied with 1,000 ml bottles.

THE ANSWER TO YOUR TANK HEATING PROBLEMS

FOR ACID HEATING JOBS

G SERIES
FUSED QUARTZ
IMMERSION HEATERS

Over 40,000 CLEPCO Fused Quartz Heaters now in service.

Dependable, controlled heat at low operating cost.

Wide range of Standard Sizes for every need.

Only Fused Quartz Heater recommended and sold by all leading plating supply houses.

FOR ALKALINE HEATING JOBS

W & WS SERIES
STEEL AND STAINLESS
IMMERSION HEATERS

Specify CLEPCO Non-Magnetic Stainless Steel Heaters for your alkaline electro cleaners and bright copper plating tanks.

Specify CLEPCO Steel Heaters for all other alkaline tanks.

All leading Plating Supply Houses can furnish from stock.

SEE YOUR PLATING SUPPLY HOUSE

Clepco

WRITE US FOR LITERATURE

CLEVELAND PROCESS COMPANY
1965 EAST 57th STREET
CLEVELAND 3, OHIO

Equipment & Supplies

E—825. Carbonate Remover—A new carbonate remover, Wes-X 150®, has been developed by the Electroplating Projects Department of Westinghouse Electric Corporation for use in any proprietary alkaline cyanide plating process in which removal of carbonates is desirable. The new carbonate remover precipitates carbonates in exchange for cyanide ions. It also assists in the elimination of certain contaminants.

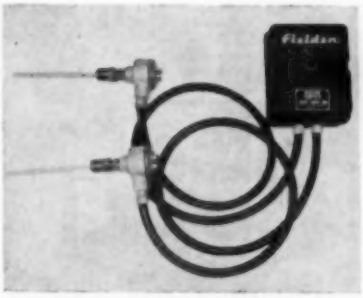
Representing a new approach to the control and maintenance of alkaline cyanide plating processes, the new carbonate remover can be used in conjunction with hydrated lime to maintain optimum concentrations of hydroxide and free cyanide without alkali metal cyanide or hydroxide additions. It is an ideal source of cyanide ions when complexing metal cyanides in both sodium and potassium types of plating solutions.

Use of the new product can also eliminate the necessity for batch treating the entire solution. Only a small portion of the solution requires treatment at one time. The new carbonate remover is supplied in metal drums in formulations for either sodium or potassium solutions.

E—826. New Variations of Electronic Level and Flow Control Instrument—Three variations of a standard electronic level and flow detector and controller have been developed, offering users additional sensitivity, flexibility and economies, according to an announcement by the Fielden Instrument Division of Robertshaw-Fulton Controls Company.

The new instruments, all modifications of the standard Tektor, are called the tube-in-probe Tektor; differential Tektor; and time delay Tektor.

Controller



Greater Accuracy

To insure greater accuracy in controlling the levels of substances having low electrical conductivity, or in interface applications where materials are of similar dielectric constant, the company perfected the tube-in-probe Tektor.

The tube-in-probe model features additional circuitry, housed in an explosion-proof condulet and integrally mounted with the sensing probe of the instrument.

Second of the new developments, the differential Tektor, offers one instrument level control in vessels where a definite differential must be maintained between high and low points. Normally two instruments are required in such applications.

The differential Tektor is applicable to situations in which the span between high and low levels is approximately five feet.

A limitation of the new device, the company cautioned, is that it must be used only in situations where the cycle of rising and falling is completed continuously. This is required in order to operate the controls properly.

The time delay Tektor, third of the new models, was designed specifically to control the flow of material that is delivered in clumps, waves or generally erratic. According to the company, the new instrument avoids the convulsive "start and stop" performance of control pumps, motors, and valves, and also eliminates "relay chatter" of such equipment being controlled.

COMPACT • PORTABLE • AUTOMATIC

Sel-Rex JET PLATER

A COMPLETE PLATING UNIT

Consisting of

- RECTIFIER with automatic timer
- TANK
- FILTER
- PUMP
- AGITATION
- TEMPERATURE CONTROL

Designed for high speed, mass production precious metal plating or for use in the laboratory for any small-volume alkaline plating bath. Also ideal for use with a portable plating barrel. The JET-PLATER is equipped with a stainless steel tank but can be furnished with a rubber-lined or kerosseal tank for acid plating solutions.

Standard models—10, 20, 30 gallon tanks, available with or without continuous filtration system. Other sizes to specification.

SEL-REX PRECIOUS METALS, INC.

Dept. PL-8, 229 Main Street • Belleville 9, N. J.

Pioneers and developers of better gold, silver, nickel, copper, cadmium and rhodium salts and solutions.

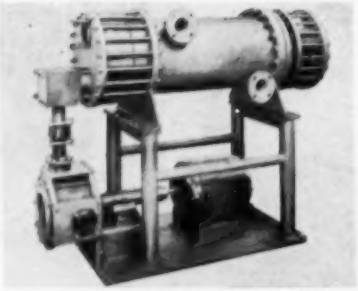
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 835.

Equipment & Supplies

E—827. Pumping-X-Changers in Wide Capacity Range—This new line of Impervite unitized pumping heat exchangers gives a versatile, packaged piece of equipment completely factory fabricated, tested and ready for immediate operation. It is designated the Impervite Pumping-X-Changer, by the Falls Industries, Inc., Salon, Ohio.

If desired, the new Pumping-X-Changer can be made portable. This feature can be especially advantageous for pharmaceutical and pilot plants, plating and pickling operations, or any instance where small batch operations are performed.

The Impervite Pumping-X-Changer is produced from Impervite, an improved



Portable Pump

form of impervious graphite, which is immune to the effects of all corrosives except a few very highly oxidizing agents. Impervite is relatively light in weight, is completely unaffected by thermal shock, and possesses an unusually high rate of thermal conductivity.

Impervite Pumping-X-Changers are produced from standard, stocked Impervite tube and shell heat exchangers (to 917 sq ft transfer surface) in combination with standard Impervite centrifugal pumps (to 200 gm at 100 ft head). Larger Pumping-X-Changers are available on special order.

E—828. Kojic Acid for Chelating—Kojic acid, a uniquely active pyrone, seen as an important base for the manufacture of cosmetics, azo dyes, local anesthetics, and in forming metal chelates, is now available in commercial quantities according to an announcement by Chas. Pfizer & Co., Inc.

Isolated initially by Japanese researchers almost half a century ago as a by-product of the fermentation of steamed rice, Kojic acid will be produced by Pfizer's advanced techniques of fermentation. It is the latest in the company's new series of industrial chemicals made by this process.

"It is a multi-functional molecule which will prove important to many industrial chemists" according to Allan J. Greene, director, commercial development. "A simple pyrone which occurs naturally as a product of fungous metabolism, Kojic acid reacts at every position in its structure.

Researchers, he added, have also found that this new chemical compound has some bacteriostatic action, inhibiting the growth of streptococci, staphylococci and Shigella paradysenteria.

"In addition, Kojic acid can be used to make resins, aldehyde condensation products, halogen derivatives, Mannich Bases, pyridones, pyridines. Some dyes prepared from this compound," Greene added, "possess fastness to washing and light when used on cotton, silk and wool.

He said that Kojic acid has a good ultra violet absorption curve and may be useful as a sunscreen in cosmetic preparations."

"Perhaps the most important property of Kojic acid", Greene said, "is its ability to form stable metal chelates at positions 4 and 5 of its molecular ring."

(Metal complexes or chelated metals currently are being used as inhibiting agents, antioxidants, rancidity preventives, and for water softening. In the pharmaceutical and food and beverage fields small quantities of chelating agents also have been known to control the deleterious action of trace metals.)

According to Greene, Kojic acid forms insoluble salts with heavy metals such as copper, iron and zinc. Other salts and metal complexes of Kojic acid he said have been prepared containing sodium, barium, calcium, strontium, tin, mercury, cadmium, manganese, aluminum, lanthanum, praseodymium, neodymium and samarium.

Kojic acid is available from Pfizer as a crystalline powder. It has a molecular weight of 142.11, a melting point of 152–154° C and is readily soluble in water, acetone, alcohol and ethyl acetate.

"218X" is TOUGH

...and flexible, too

Racks with Unichrome Coating 218X can take not only hard use but even abuse. So tough is this heavy duty flexible coating, it resists scuffing, won't tear or chip. It maintains sleek, smooth, tight protection in severest plating operations . . . rinses freely to minimize drag-in and drag-out problems.

Chemically, too, it's tough. Use this green, plastisol coating in all plating, cleaning and anodizing operations, even with vapor degreasing cycles . . . and you'll see service you didn't think possible.

Detailed information is available.

UNICHROME

materials · processes · equipment

for better plating at less cost

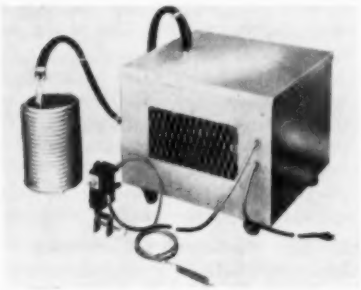
UNITED CHROMIUM DIVISION
METAL & THERMIT CORPORATION

100 East 42nd Street, New York 17, N. Y.
Detroit 20, Mich. • Waterbury 20, Conn.
Chicago 4, Ill. • Los Angeles 13, Calif.
In Canada: United Chromium Limited, Toronto 1, Ont.

Equipment & Supplies

E—829. Claims for Deruster, Descaler—DU-AL No. 489—a new, unique multipurpose alkaline compound that removes "rust, scale, paint, grease, oil, etc." in one operation has been developed by Chemclean Products Corp., Brooklyn, N.Y. Its advantages are: Noncorrosive to sound ferrous metals; can be used as a soak or electrolytically with reverse or direct current; eliminates the possibility of hydrogen embrittlement caused by acid descaling; eliminates the need for acid pickling in rust removal; eliminates acid disposal problems; is economical and long lasting; can be used in a mild steel tank; and performs several important functions in one operation and incorporates many advantages not found in any product now on the market.

E—830. Portable Cooling Coil—New control principle allows longer compressor life and the use of a sensitive thermostat for rapid cycling and extreme close temperature control with Blue M's Constant-Flow Portable Cooling unit which controls liquid temperatures below ambient to one degree centigrade (1.0° C) is now possible. unique thermostatic expansion valve hookup permits wider versatility and more stable results.



Cooling Coil

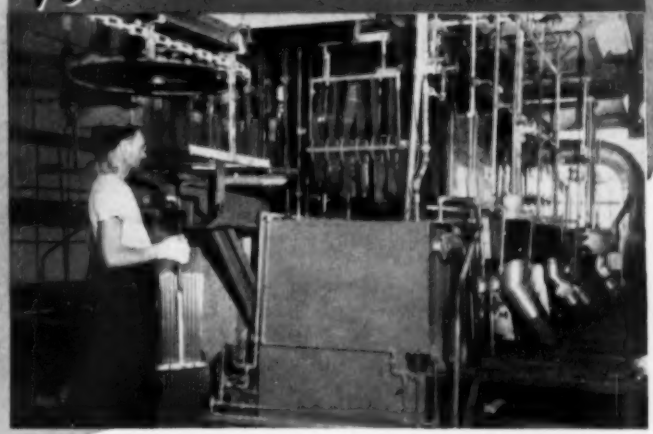
In Blue M's Constant-Flow Portable Cooling Unit, the compressor is permitted to run constantly. Temperature of bath is controlled through directional flow solenoid valve and U. L. approved automatic hydraulic thermostat to ±.15° C. When bath reaches required temperature, a thermostat actuates the solenoid valve which in turn closes the line to the main evaporator and diverts refrigerant through the auxiliary evaporator.

Other construction features include ample capacity hermetic sealed compressor-condenser, rubber encased armored flexible tubing connection, 6 feet long, between compressor and cooling coil for longer life and protection. Nickel-plated heavy gauge portable copper cooling coil. Heavy steel construction cabinet is well vented and mounted on four ball-bearing casters for easy mobility.

Get All these Advantages in CHROME PLATING and ANODIZING

with

Nalcite® ION EXCHANGERS



- REDUCE WASTE DISPOSAL
- RECOVER RINSE WATER
- INCREASE PRODUCTION
- IMPROVE QUALITY
- RECOVER VALUABLE METALS
- LOWER CURRENT DEMAND
- REDUCE REJECTS

You can solve major waste disposal or water conservation problems ... and get *five extra advantages* ...with the Nalcite Ion Exchange process in your plating or anodizing plant.

Check these plus benefits in the list at left. They are important contributions to efficiency and economy in plating processes. We invite you to write, today, for full information on Nalcite Ion Exchangers.

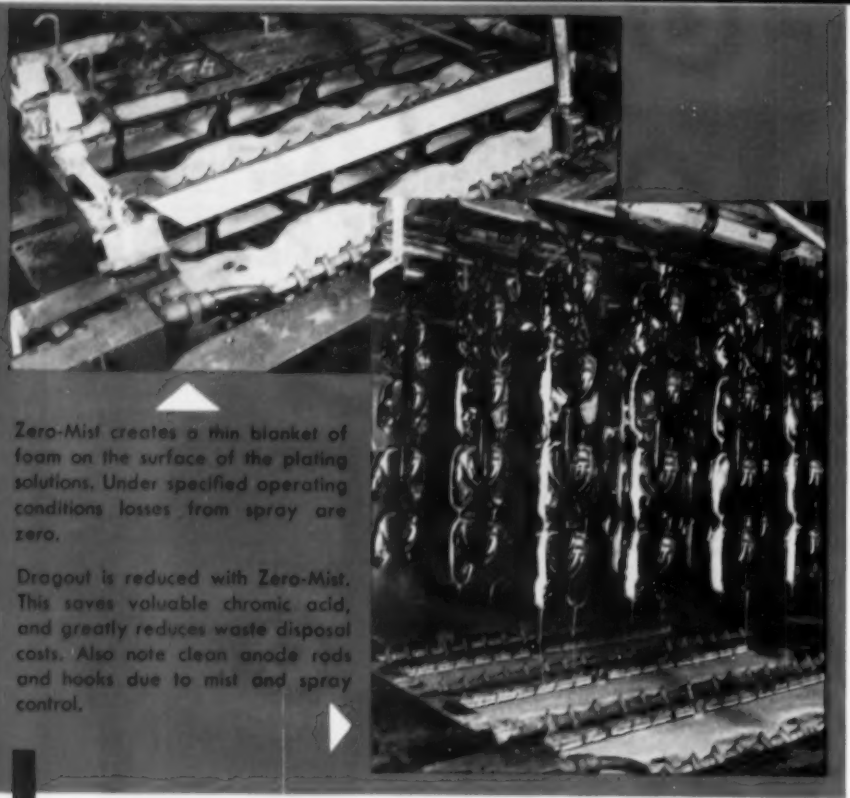
NATIONAL ALUMINATE CORPORATION

6301 West 66th Place • Chicago 38, Illinois

In Canada: Alchem Limited, Burlington, Ontario

Nalco®

PRODUCTS . . . Serving Industry through Practical Applied Science



Zero-Mist creates a thin blanket of foam on the surface of the plating solutions. Under specified operating conditions losses from spray are zero.

Dragout is reduced with Zero-Mist. This saves valuable chromic acid, and greatly reduces waste disposal costs. Also note clean anode rods and hooks due to mist and spray control.

DECORATIVE CHROME PLATERS!

***Get a free sample of* ZERO-MIST**

for an easy test in your own shop

Now you can make your own simple test of Zero-Mist—the magic new product which controls mist and spray in chrome plating baths. Udylite is making this offer to familiarize chrome platers with the many advantages of Zero-Mist.

Many chrome platers are now using Zero-Mist with amazing results. Here's what it will do for you: give absolute control of chromic acid mist and spray saving up to 30% of chromic acid loss through the ventilating ducts—reduce the workroom air pollution—cut dragout losses—lessen pollution of rinse water—save on maintenance of existing hoods, ducts and fans used in ventilating systems—cut your chromic acid losses from mist, spray and dragout up to 70%.

Write for a Zero-Mist sample today. We will send it to you free with complete instructions for an easy small scale test in your own shop. Fill out coupon below.

WORLD'S LARGEST PLATING SUPPLIER

THE **Udylite** CORPORATION
DETROIT 11, MICHIGAN

Please send a free sample of Zero-Mist with instructions which will enable us to make our own test. Mail to:

NAME_____

COMPANY_____

STREET_____ ZONE_____

CITY_____ STATE_____

Equipment & Supplies

Quick Clamp

E—831. Hose Clamp on in Three Seconds—A new type of general purpose hose clamp has been developed that can be fixed in place in three seconds with an ordinary pincers. Lasting and positive clamping action is assured under extreme internal hose pressure, hose movement and tough usage. Simplified application of the new one-piece clamp is said to save on both clamping time and costs.

The clamp, manufactured by the Circle Clamp Corporation, New York, is round with U-shaped folds or lugs. Smaller size clamps have two lugs and the larger ones, three. The device is merely slipped on the hose or part and crimped in place by squeezing the parallel sides of the lugs together with the pincers.

There is no danger of the pincers slipping because the pressure of the jaws is approximately perpendicular to the surfaces of the parallel sides. To remove the clamp, the lugs are simply snipped off with the pincers. Initial low cost of the clamp makes replacement in the field economical.

E—832. Packaged pH System—The Beckman Division of Beckman Instruments, Inc. has just announced the availability of a "packaged" *p*H control system.

pH Package

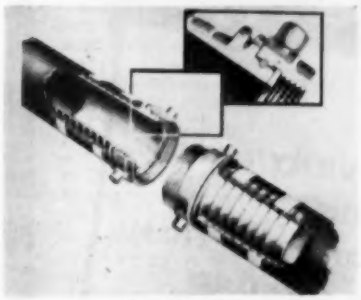
Designed for use in any *p*H process application, these systems combine, in a single package, all the components needed for single or multiple-channel *p*H process monitoring, recording and controlling. The entire system is built at the factory, wired, piped and assembled ready for plug-in installation. The basic components can be assembled into a number of different combinations from the simple combination of *p*H meter and alarm to the multiple-channel monitor-recorder-alarm-control system.

INDICATE A 838.

Equipment & Supplies

E—833. Coupling for Pressure—The new Universal Union Shank Hose Coupling, especially designed for handling petroleum products under pressure, can be used with any liquid where suction or discharge is involved.

A replacement pin lug or hex swivel nut and a cast-in flange are but two of the engineering features of the Universal Union Shank Hose Coupling. A tie wire, which secures the swivel ring to the shank, permits easy replacement of the ring should the threads ever be damaged, thus reducing the necessity of discarding the entire unit.



Hose Coupling

The cast-in flange of the Universal Union Shank Hose Coupling acts as a cushion upon which the hose end rests. This eliminates any possibility of the hose interfering with the swivel action or the hose fabric material becoming frayed. Also, a special groove on the flange provides abundant anchor area for hold-back wire where wire is required to prevent pulling apart of hose under severe pressure conditions.

Designated as No. 800 the Universal Union Shank Hose Coupling is available in 2 and 3 inch sizes. Other sizes are available on request. The No. 800 coupling is made for heavy-duty, is nonsparking, and has full flow design.

A corrugated designed shank gives positive hose gripping area without injuring the hose; in addition, the Universal Union Shank Hose Coupling has a large gasket area provided with a long life leather gasket.

E—834. Easy Threading—Quick and easy pipe threading on the job is now possible through the new Lawco Junior Portable Power Pipe Threader available from Velocity Power Tool Company, Pittsburgh, Pa.

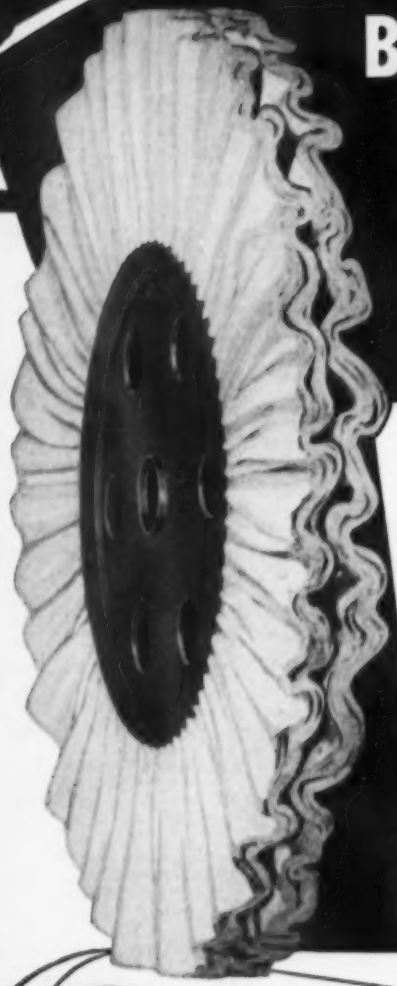
Slow, tiring handthreading jobs now are a matter of only seconds with this power driven threader. Simple adapters and a speed reducer make it possible to handle pipe from ¼ inch up to 10 inches.

Since the threader weighs only 20 pounds and is only 27 inches in length, it is easily carried to where the threading is

THE CYCLEMASTER
UDYLITE'S NEW AUTOMATIC PLATING MACHINE
OFFERS • HIGHER PRODUCTION
PERMITS • GREATER VARIETY OF PROCESSES
USES • MINIMUM FLOOR SPACE
WATCH FOR IT!
COMING SOON!!
THE Udylite CORPORATION
DETROIT 11, MICHIGAN

New SCHAFFNER BIAS buffs

give more mileage...



because

- ...FULLY VENTILATED
- ...COOLER RUNNING
- LOW COMPOUND CONSUMPTION
- ...FEWER SECTIONS NEEDED
- ...GIVES LONGER LIFE
- ...LATHE FACED AND BALANCED

Manufactured and controlled in our own new modern up-to-date Buff plant. Can be tailor made for your toughest buffing problem

MADE BY THE MANUFACTURERS OF FAMOUS AND ACCEPTED SCHAFFNER NO NUBBIN BUFFING COMPOSITIONS.

Schaffner
manufacturing company, inc.
SCHAFFNER CENTER • EMSWORTH, PITTSBURGH 2, PA.

CLIP TO YOUR LETTERHEAD

Phone ROsewood 1-9902

Please send me catalogue and complete information:

NOW PRESENTLY USING _____ Name, Manufacturer and Code No. of Buff _____
DIAMETER _____ CENTER SIZE _____
CENTER SIZE _____ ARBOR _____
PLY _____ COUNT _____
NORMALLY I USE _____ SECTIONS PER MONTH _____
NAME _____ TITLE _____
COMPANY _____ STREET _____
CITY _____ ZONE _____ STATE _____

SCHAFFNER AIR-COOLED METAL-CENTER BUFFS ARE PRICED RIGHT • PRODUCED IN ALL DIAMETERS, CENTERS, PLYS AND COUNTS

Available for Immediate Shipment, Attractive Values

THE FOLLOWING EXCELLENT REBUILT AND GUARANTEED ELECTROPLATING MOTOR GENERATOR SETS AND RECTIFIERS, WITH FULL CONTROL EQUIPMENT:

PLATERS

1—7500/3750 AMPERE, 9/18 VOLT, **HANSON-VAN WINKLE-MUNNING,** Synchronous.
1—4000/2000 AMPERE, 6/12 VOLT, **CHANDEYSSON,** 25° C., Exciter-in-head.
1—3000/1500 AMPERE, 6/12 VOLT, **COLUMBIA,** Synchronous.
1—2500/1250 AMPERE, 8/16 VOLT, **ELECTRIC PRODUCTS,** Synchronous, Exciter-in-head.
1—2000/1000 AMPERE, 9/18 VOLT, **ELECTRIC PRODUCTS.**
1—1500/750 AMPERE, 6/12 VOLT, **HANSON-VAN WINKLE-MUNNING,** Synchronous, Exciter-in-head.
1—1500/750 AMPERE, 12/24 VOLT, **CHANDEYSSON,** Synchronous, Exciter-in-head.
1—1000/500 AMPERE, 6/12 VOLT, **ELECTRIC PRODUCTS.**

ANODIZERS

1—4000 AMPERE, 40 VOLT, **CHANDEYSSON,** Exciter-in-head.
1—1000 AMPERE, 40 VOLT, **CHANDEYSSON,** 25° C.
1—1000 AMPERE, 30 VOLT, **IDEAL,** Exciter-in-head.
1—750 AMPERE, 60 VOLT, **HANSON-VAN WINKLE-MUNNING,** Synchronous, Exciter-in-head.
1—500 AMPERE, 25 VOLT, **CHANDEYSSON,** Synchronous, Exciter-in-head.
1—400 AMPERE, 40 VOLT, **M. G. C.,** Exciter-in-head.

RECTIFIERS

1—2000/1000 AMPERE, 6/12 VOLT, **G. E.,** COPPER OXIDE, with Manual Control.
1—2000/1000 AMPERES 6/12 volt G. E., brand new selenium stacks, with "On-load" Automatic Voltage Regulator.
1—**GREEN SELECTOPLATER,** 1800 AMPERE, 12 VOLT, 220/3/60.
2—**UDYLITE-MALLORY,** 1500/750 AMPERE, 6/12 VOLT, Control.

SPECIAL

1—20' x 4' x 3' H-VW-M Semi-Automatic for nickel.
1—**RANSOHOFF** SPIRAL HOT AIR DRYER.
1—**CROWN** 2-COMPT. HORIZONTAL DE-BURRING MACHINE, each compt. 20" x 36", Unlined but can be lined.
1—**CROWN** CENTRIFUGAL DRYERS, Size No. 2, Steam Heat.
1—Production Pipe Polishing Machine, Model 101, Motorized.
2—**RONCI** Enamelers, No. R-100, and No. R-200.
1—**K-4** SEMI-AUTOMATIC BUFFING MACHINE.
3—**U. S.** ELEC. TOOL, Mod. 110, TWIN 15HP POLISHING LATHES.
1—MODEL "A" PRESSURE BLAST.

Above is partial list only. Write to us for all your requirements for Plating, Anodizing and Metal Finishing

WIRE—PHONE—WRITE

M. E. BAKER CO.

25 WHEELER STREET

Kirkland 7-5460 **CAMBRIDGE 38, MASS.**

Equipment & Supplies

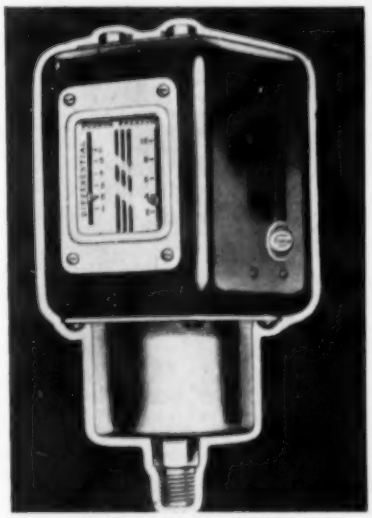
Single Operation

to be done. Likewise, it is designed and constructed for one hand operation.

Operation is extremely simple. Apply the threading dies to the Lawco tool, position the tool, then press a button and the power unit drives the cutting dies. It is equipped with a ¾ hp electric motor and a toggle switch to provide reversible power.

The tool also is versatile for it may be used as an auger, for boring post holes, driving bolts and nuts, opening valves and as a hoist for weights up to 500 pounds.

E—835. Pressure Controls—Fireye 80B Pressure Controls are designed for many important industrial uses. They provide high and low limit control for steam, air and noncorrosive liquids and gases. They may be used wherever it is desired to start or stop operations at preset maximum or minimum pressures within the range 3 inch vacuum to 240 psig. On heating installations the new controls may be used for high limit safety or to maintain steam pressure within set limits.



Automatic Watchman

When used with industrial oil, gas, or combination gas-oil burners, the controls supply all required excess and minimum pressure safety interlocks. High limit controls open contact on pressure rise, shutting down operation when pilot or main gas line pressure reaches a preset safe maximum value.

THE FINISHING TOUCH

VERSATILITY OF ALUMINUM FINISHES

by A. H. Kirkpatrick
Stevens Special Project Engineer

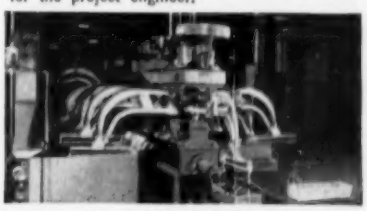
A look at the 1955 design engineer's drawing board leaves little doubt that aluminum is past adolescence.

Aluminum responds to any number of finishing processes. Polishing and buffing will produce both satin and mirror bright finishes. Barrel Roto-Finishing will remove minor surface irregularities and improve the finish of small castings and forgings.

Stevens L. V. Experimental Aluminum Buffing Operations.

Many chemical and electro-chemical immersion finishing processes, including anodic etching, electroplating, anodizing, electropolishing and bright dipping add versatility to the finishing of aluminum. In anodizing, dyes can be added for brilliant colored finishes.

Aluminum's coming of age makes the task of producing these aluminum finishes a real job for the project engineer.



Stevens Automatic Equipment for bright dipping of aluminum.

Today, increased production, lowered costs and improved finishes, resulting from automatic, **job-qualified,** finishing installations are available to finishers of aluminum through Frederic B. Stevens, Inc. Stevens experience in the field of aluminum finishing ranges—

From the anodizing of refrigerator trays to the coloring of tumblers . . .

From the plating of automotive trim to the buffing of light reflectors . . .

From tumble finishing of aircraft assemblies to the alroking of rivets . . .

Stevens can engineer and build complete automatic or still tank installations for any chemical or electro-immersion aluminum finishing process—furnish the supplies and equip your company to do the best job at **lowest** cost. If it's made of aluminum we know how to finish it. Call in your nearest Stevens representative or write direct to:

FREDERIC B. STEVENS
INCORPORATED
YOUR METAL FINISHING SUPERMARKET
DETROIT 16, MICHIGAN

Equipment & Supplies

E—836. Danish Plating Process—A distinctive new plating process known as Cunit has been recently perfected in Den mark on a commercial scale and is now available in America under licensing arrangements.

Cunit closely approximates polished sterling silver in appearance, and has a soft, lustrous, brilliant finish, yet does not tarnish and never needs polishing. It is an alloy consisting principally of copper and tin and can be applied over steel and most nonferrous metals at a cost comparable to nickel plating. The alloy is readily applied through electrochemical processes in a high and exceptionally uniform quality, making it especially suitable for table ware, electrical appliances, and the many other products that depend on a high degree of eye appeal for volume sales.

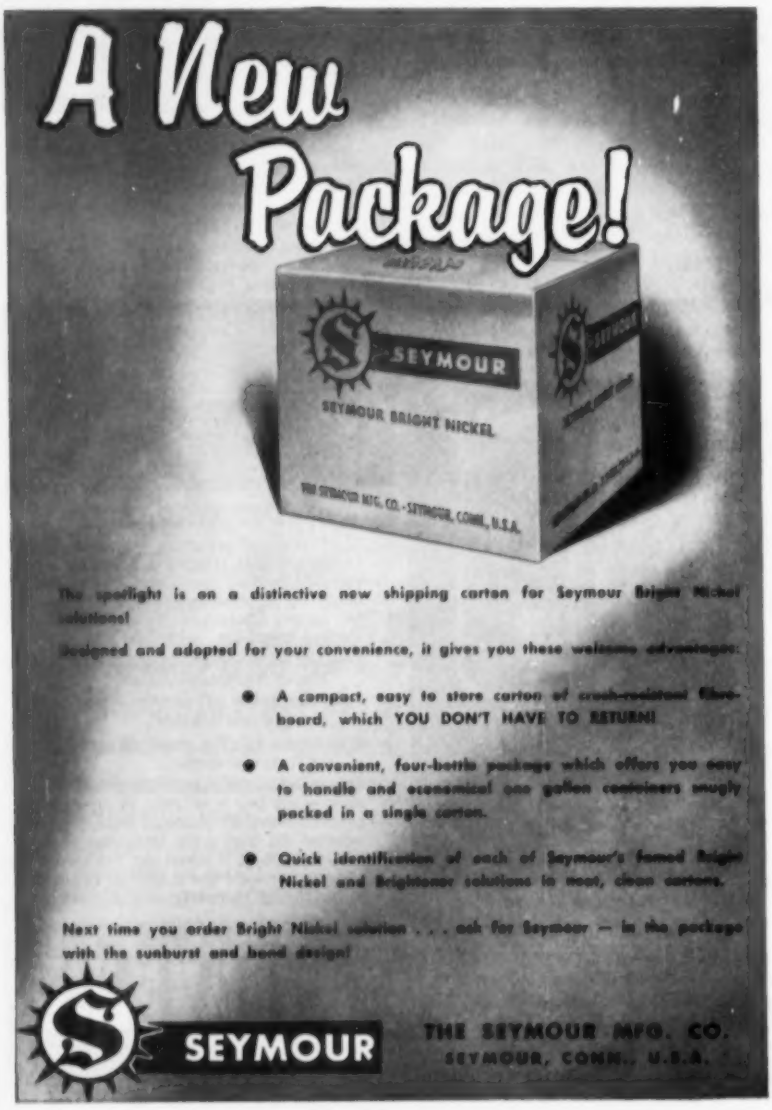
Cunit forms a compact and nonporous coating that adheres so firmly to the base metal that it cannot peel or flake off. Intermediate between nickel and chrome in hardness, it is highly scratch resistant.

In order to develop the bright luster characteristic of Cunit, buffing is necessary, but it is claimed that since Cunit can be applied directly to steel, it is cheaper than the nickel-copper-bright chrome method in many instances. The high-melting point of Cunit combined with its impervious coating has led to its use in certain case hardening applications with excellent results. Ease of control in Cunit plating is emphasized through the use of only one plating alloy. It is said that most plating facilities can be converted to Cunit with a minimum cost. The principal requirements are for a heated tank for the plating solution and a ventilating system to carry off fumes developed in the process.

E—837. Vapor Degreaser Uses Special Sludge Sump—Phillips Manufacturing Company, Chicago, Ill. announces its new series of electric, gas or steam heated heavy duty degreasers to meet the need for degreasing parts or assemblies heavily laden with very thick soil, soluble, insoluble, or both. This new heavy duty degreaser has been developed in order to solve the problem of draining off heavily contaminated vapor degreasing solvent, permitting longer operation between cleanout periods.

A unique double sump provides the key to the heavy duty feature of the machine. One sump contains the heating element which brings the solvent to a boil, the other sump is a repository for the contaminated solvent which runs off from a drain plate above the boiling sump. A removable sludge pan is located in this settling sump. Heavy particles settle out into the sludge pan, leaving the relatively clean solvent free to return to the boiling sump for reuse. The sludge pan can be removed, emptied and replaced with a minimum interruption in work. A flusher pump and spray can be installed to flush out soil from recesses in the parts.

The new units are available in four different standard sizes, handling work requirements from 4,000 to 12,000 lb./hr. Special sizes and requirements can be made to order. Electric, gas or steam heated units are available depending on requirements. A constant level solvent control admits clean solvent as required from the storage tank.


A New Package!
SEYMOUR
SEYMOUR BRIGHT NICKEL
THE SEYMOUR MFG. CO. - SEYMOUR, CONN., U.S.A.
The spotlight is on a distinctive new shipping carton for Seymour Bright Nickel solutions!
Designed and adopted for your convenience, it gives you these welcome advantages:
• A compact, easy to store carton of crush-resistant fiberboard, which YOU DON'T HAVE TO RETURN!
• A convenient, four-bottle package which offers you easy to handle and economical one gallon containers snugly packed in a single carton.
• Quick identification of each of Seymour's famed Bright Nickel and Brightener solutions in neat, clean cartons.
Next time you order Bright Nickel solution . . . ask for Seymour — in the package with the sunburst and bead design!
SEYMOUR
THE SEYMOUR MFG. CO.
SEYMOUR, CONN., U.S.A.

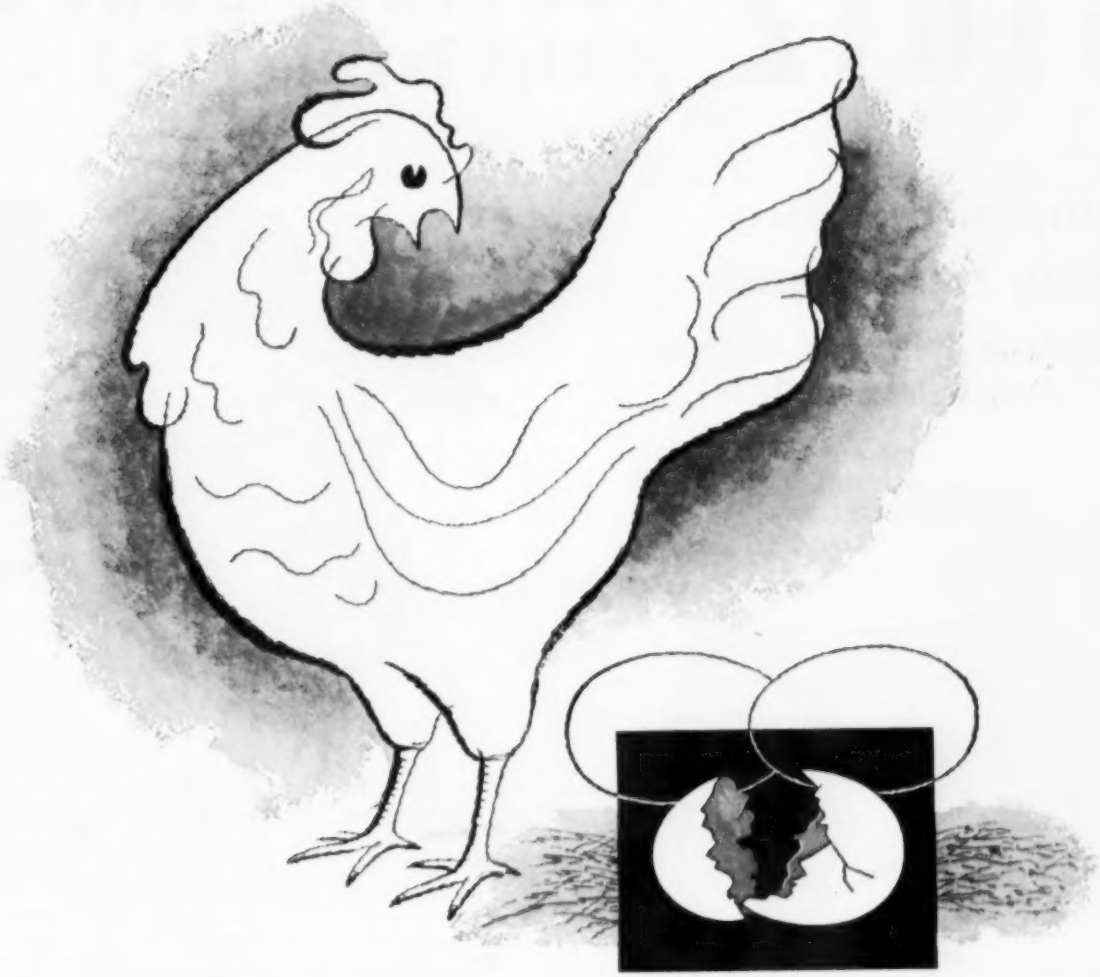
Important Notice to Members and Subscribers

If you are going to move, it is necessary that the proper notification be made, at the earliest possible moment, so that you may continue to receive your copies of PLATING without interruption.

Such notification should be made to headquarters by letter, post card, or post-office form No. 22S, giving the old address as well as the new, with postal-zone number if any. You should also notify your local post office on postal form No. 22 of your change of address. Both postal forms are obtainable at any post office.

As considerable time is required to process a change of address, you are urged to advise the PLATING Circulation Department as soon as you know your new address, preferably three weeks in advance of moving.

PLATING
Circulation Department
445 Broad Street
Newark 2, N. J.



STOP WASTING . . . PROFITS

In solving your plating waste treatment problems, Graver equipment can save the dollars you've been throwing away. In addition to avoiding pollution, treated "waste" can often become a source of valuable raw materials and water suitable for process use. Graver equipment, backed by 45 years of experience and research, is specifically engineered to get such results for you.

Write for the following bulletins and articles:

WC-116	Industrial Waste Treatment
WC-111	Ion Exchangers
T-123	Applications of Ion Exchange to Plating Plant Problems
T-130	Ion Exchange, A Practical Tool in the Plating Room

GRAVER

Industrial Waste Treatment Department: W-112-A

GRAVER WATER CONDITIONING CO.

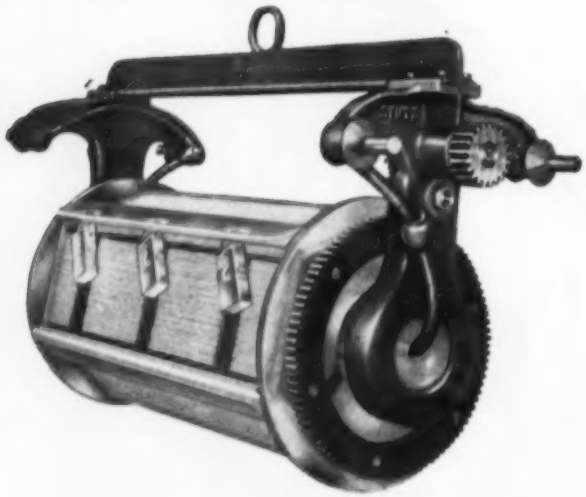
A Division of Graver Tank & Mfg. Co., Inc.

216 West 14th Street, New York 11, N. Y.

STUTZ PLATING BARRELS of High Tensile PLEXIGLAS

for:

- **Heavy Duty Production**
- **Highest Possible Current**
- **Complete Cycle—all solutions (temperatures to 180°)**



Stutz Plating Barrel Unit for continuous operation through Alkali Cleaning, Acid Pickling, Acid and Alkaline Plating solutions and rinsing. Largest number of cylinder perforations possible.

Stutz Plating Barrel Unit, Motor Drive Mounted Overhead. Continuous rotation of cylinder from one operation to another and where a minimum of solution dragout is important. Roller bearing chain drive to absorb load shock. On a complete Barrel Plating installation, this type of equipment can be made at lower cost since motor drives are not required on each tank station. Sizes 12″x24″ to 18″x24″ I.D.

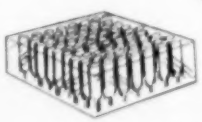
DELUXE PORTABLE PLATING BARREL

Made in 2 standard sizes. Also smaller and with partitions.

Standard openings	3/32″
6″ x 12″, I.D.	$176.50
8″ x 18″, I.D.	$275.00
Stand (for either size)	$ 37.50
Basket (for either size)	$ 8.65

On inquiry specify whether production or portable barrels are desired.

PATENTED DUAL HOLE



Where extremely small openings are required, our patented Dual Hole is used. This design permits solution flow with a minimum of resistance.

5″ CYLINDER BEARINGS

Cylinder bearings 5″ diameter for heavy duty service and maximum life. Trunions are retained with sealed-in stainless steel bolts. Replacement made quickly if necessary.

WRITE TODAY FOR OUR NEW COMPLETE 1955 CATALOG. JUST OFF THE PRESS.

GEORGE A. STUTZ MFG. CO.

4420 CARROLL ANENUE • CHICAGO 24, ILLINOIS

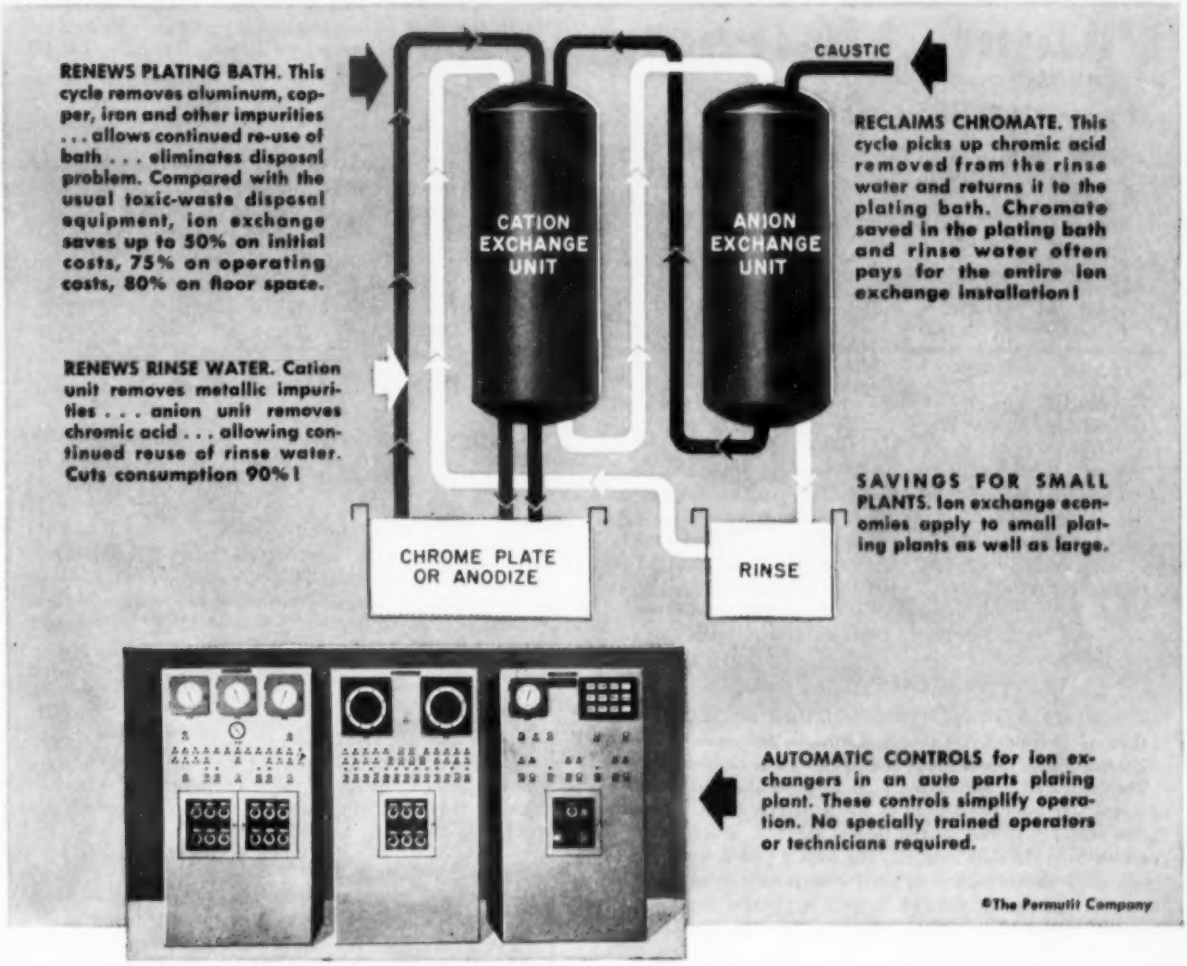
"Complete metal finishing equipment and supplies"

Serving Industry for 35 Years

PLATING

9B6

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 845.


RENEWS PLATING BATH. This cycle removes aluminum, copper, iron and other impurities . . . allows continued re-use of bath . . . eliminates disposal problem. Compared with the usual toxic-waste disposal equipment, ion exchange saves up to 50% on initial costs, 75% on operating costs, 80% on floor space.
RENEWS RINSE WATER. Cation unit removes metallic impurities . . . anion unit removes chromic acid . . . allowing continued reuse of rinse water. Cuts consumption 90%!
CAUSTIC
CATION EXCHANGE UNIT
ANION EXCHANGE UNIT
RECLAIMS CHROMATE. This cycle picks up chromic acid removed from the rinse water and returns it to the plating bath. Chromate saved in the plating bath and rinse water often pays for the entire ion exchange installation!
SAVINGS FOR SMALL PLANTS. Ion exchange economies apply to small plating plants as well as large.
CHROME PLATE OR ANODIZE
RINSE
AUTOMATIC CONTROLS for ion exchangers in an auto parts plating plant. These controls simplify operation. No specially trained operators or technicians required.
©The Permutit Company

Ion Exchange Cuts Plating Costs

Modern ion exchange equipment really pays off for plating plants. Here's why:

Faster production. Dip periods are shorter, and there's no down-time for dumping because baths are always at full strength. Time savings are biggest for bright-dipping, anodizing, etching, stripping.

Better quality. Clean baths produce more uniform plating deposits. Clean rinses prevent water stains and spots.

Lower operating costs. Contaminant-free baths use less current. The improved quality means fewer rejects . . . and reduced polishing and wiping costs.

A large aircraft manufacturer saved $10,000 on anodizing in the first year with ion exchange. A leading auto maker prevented a stream pollution shut-down, improved quality, reduced costs . . . and uses the same ion exchange equipment for treating other process water in the plant!

Largest manufacturer of ion exchange equipment, The Permutit Company, is the only firm that offers a complete ion exchange service: rinse water or bath analysis, engineering, equipment, ion exchange resins and automatic controls . . . *all from one source.*

For details, write: The Permutit Company, Dept. PL-8, 330 West 42nd St., New York 36, N. Y.

PERMUTIT®

rhymes with "compute it"

ION EXCHANGE

for Water Conditioning • Chemical Processing

Patent Abstracts

DR. D. GARDNER FOULKE

Manager, Electrochemical Development
Hanson-Van Winkle-Munning Co.
Matawan, New Jersey

Copies of patents may be obtained by writing to Commissioner of Patents, Washington, D. C. Price 25 cents each

No. 2,699,413, January 11, 1955—Coating Composition for Containers and Closures—G. Seagren and L. Reymann, assignors to Stoner-Mudge, Inc., Pittsburgh, Pa.

The composition relates to resinous coatings applied to black plate and the composition consists of a combination of two resins and phosphoric acid in an organic solvent. Of the resin portion, 50 to 80 per cent is a polyepoxide polyglycidal ether of bisphenol (mol wt 1500–7200) and 50 to 20 per cent of an alkali catalyzed condensation product of formaldehyde with a phenol (dialkyl or 2- and 4- monoalkyl) orthophosphoric acid in the amount of 5 to 20 per cent of the weight of resins is also added. 8 claims.

AES

No. 2,699,423, January 11, 1955—Method in the Production of Duplicate Tools—S. Linbom, assignor to Husqvarna Vapenfabriks Aktiebolag, Huskvarna, Sweden.

The invention concerns the production of duplicate models of metal, particularly pressing tools. A covering layer of easily fusible metal is placed on the face of the tool which is then removed from the shell formed. The shell is plated with a relatively hard metal, backed up, and iron powder compacted in this mold and finally sintered to yield a positive duplicate of the pressing face of the tool.

7 claims, 5 figures.

AES

No. 2,699,424, January 11, 1955—Electroplating Process for Producing Plated Circuits—T. Nieter, assignor to Motorola, Inc., Chicago, Ill.

The process consists of depositing a silver conducting base on a nonconductor, masking and plating with copper. The resist is then removed and the silver treated with sodium hypochloride solution to convert the silver to a nonconductive material. Other claims cover the use of sodium thiosulfate or ammonium hydroxide solutions to remove the hypochlorite acidified silver.

5 claims, 6 figures.

AES

No. 2,699,425, January 11, 1955—Electroplating Electrical Conductors on an Insulating Panel—T. Nieter, assignor to Motorola, Inc., Chicago, Ill.

The invention deals with forming conductive areas on both sides of an insulating panel with apertures through the panel also made conductive to provide electrical interconnection. A feature of the invention according to the disclosure is the use of a silk screen stencil method to insulate areas on which plating is desired. The actual procedure is to silver, resist cover as needed, plate, remove resist and treat with hypochlorite, etc., as in patent No. 2,699,424.

6 claims, 15 figures.

AES

No. 2,699,632, January 18, 1955—Buffing Wheel and Method of Making Same—G. Lyon, Detroit, Mich.

The buff is of the flat type for circular discs or wheel covers. A cup-like container with a peripheral wall generally conforming to the work pieces contains a continuous strip of fabric coiled edgewise from the center outward. The fabric is preferably cut on the bias.

5 claims, 3 figures.

AES

No. 2,700,004, January 18, 1955—Method of Pickling Iron and Recovering the Pickling Agent—C. Miller, assignor to Cleveland Industrial Research, Inc., Cleveland, Ohio.

The method consists essentially of pickling the ferrous object in ammonium acid sulfate, oxidizing the iron formed and raising the pH to at least 7 to yield diammonium sulfate and ferric hydroxide (later the oxide). The diammonium sulfate is heated to yield the ammonium acid sulfate for pickling again and ammonia for further neutralization as required.

12 claims, 1 figure.

AES

No. 2,700,019, January 18, 1955—Acid Copper Plating—G. Jernstedt and M. Ceresa, assignors to Westinghouse Electric Corp., East Pittsburgh, Pa.

The electrolyte claimed is the usual copper sulfate-sulfuric acid solution containing also 0.0005 to 0.05 oz/gal of at least one 2-thiohydantoin compound and up to 3 oz/gal of an organic, water soluble carboxylic acid such as citric, malic, maleic, linoleic, oxalic, adipic or aconitic. One claim mentions the additional use of 0.1 to 5.0 oz/gal of dextrin as well as periodic reverse current.

Example II is as follows:

Copper sulfate (crystals)	27.5	oz/gal
Sulfuric acid	6	oz/gal
Citric acid	0.25	oz/gal
1-acetyl-2-thiohydaritoin	0.007	oz/gal

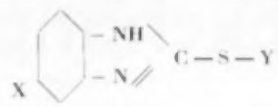
Bath temperatures of 120° F to 125° F gave best results at current densities of 50 to 100 asf.

10 claims, 2 figures.

AES

No. 2,700,020, January 18, 1955—Plating Copper—W. Pierce, assignor to Houdaille-Hershey Corp., Detroit, Mich.

An aqueous copper sulfate-sulfuric acid electroplating process for obtaining bright deposits is claimed. The addition agent is a heterocyclic organic compound of the general structure:



where, x may be H or NH_2

y may be I and alkyls with 1 to 4 carbons

The amount of brightener used is of the order 0.005 to 1 g/l and the preferred operating temperature is 95–100° F.

7 claims.

AES

No. 2,700,021, January 18, 1955—Process for Reducing Cyclooctatetraene—R. Elofson, assignor to General Aniline and Film Corp., New York.

Cyclooctatetraene is reduced in a catholyte consisting of an aqueous lower alkanol containing a lower tetraalkyl ammonium halide at 0–80° C, 10–20 $asdm^2$ and 10 to 20 volts.

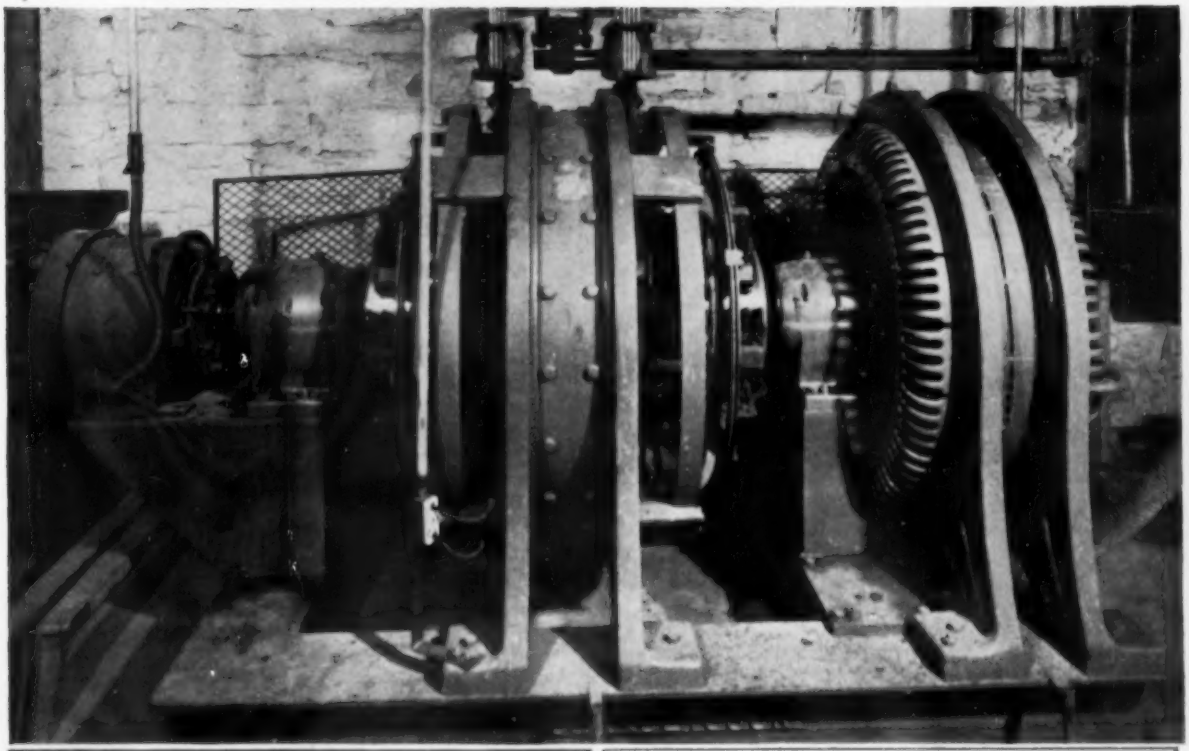
2 claims.

AES

No. 2,700,212, January 25, 1955—Electrical Conductor—E. Flynn and G. Young, assignors to General Electric Co.

A conductor with improved abrasion resistance is claimed. It consists essentially of (1) a core of copper having an outer shell of anodized aluminum and (2) an outer sheath of chlorotrifluoroethylene in direct contact with the aluminum.

3 claims.



INDUSTRY LEADERS CHOOSE

Chandeysson

ELECTROLYTIC GENERATORS

Example:

At PRECISION ENGINEERING CORPORATION . . . this rugged 7500 ampere, 6 volt Chandeysson Motor Generator provides dependable low-voltage power for a wide range of production operations.

THE LONG LIFE of Chandeysson Motor Generators is dramatically demonstrated by the fact that some of the first Chandeysson units ever built . . . half a century ago . . . are still giving reliable service, day after day.

YOU SAVE 4 WAYS WITH Chandeysson GENERATORS

Use Less Power . . . precision-built for efficiency and built-in voltage regulation.

Be Sure of Power When You Need It Most . . . overload capacity as great as 50% momentarily and 25% sustained, without distress or damage.

Get More Out of the Power You Pay for . . . built-in high power factor at no extra cost.

Enjoy Lifetime Power Dividends . . . sustained, lifetime overall constant efficiency as high as 85% does not decrease with age or overload.

59

For product information write for bulletins D-101 and D-102—for names of users and installation data ask for bulletin D-104.

CHANDEYSSON ELECTRIC COMPANY • 4078 Bingham Ave., St. Louis 16, Missouri

Cut costly buffing— save half— get better results

The piece at the left was plated by the usual cyanide process and buffed. The piece on the right was "PR"—Periodic Reverse—plated but was not buffed. One-half to two-thirds the total cost was saved because the buffing operation was skipped entirely. Result: the "PR"-plated piece has far superior leveling at much less cost!

You too can eliminate or greatly reduce expensive prefinishing and get superior leveling like this with any thickness by using "PR"—Periodic Reverse—plating and Westinghouse Wes-X® compounds. The electrical "back-stroke" feature of "PR" plating continuously refines the grain structure. "PR" plating eliminates nodules, does away with build-up of metal at corners and sharp points, and covers such defects as die marks and scratches.

"PR" plating is a patented Westinghouse process. It is available to you through your local Westinghouse sales engineer. Let him make a free survey of your plant. Call your nearest Westinghouse sales office or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-10445

YOU CAN BE SURE...IF IT'S

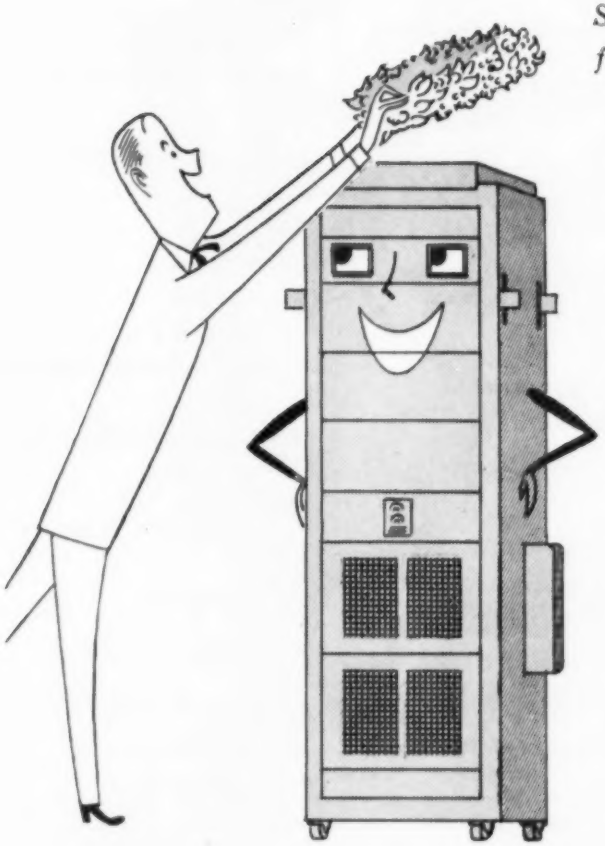
Westinghouse

BUFFED

PR PLATING
NO BUFFING

DID YOU KNOW?

NEARLY EVERY FEATURE NOW AVAILABLE ON ELECTROPLATING RECTIFIERS WAS ORIGINATED BY GREEN ELECTRIC — AND MOST OF THESE OVER A DOZEN YEARS AGO



Some of the standard and special features in Munning-Green Rectifiers:

- Skyscraper cabinets to save floor space
- Caster mounting to simplify installation
- Meters and lamps at eye level
- Controls and pushbuttons at hand level
- Twin pairs of output terminals
- Automatic current overload protection
- High temperature visual and audible warning signals
- High temperature automatic shutdown
- Anti-single-phase protection
- Downdraft cooling
- "L" circuit for low ripple and high efficiency
- Dual input
- Dual, triple and quadruple output
- Pushbutton remote control
- Automatic voltage stabilization
- Automatic current stabilization
- Automatic ampere-hour control
- Automatic time control
- Factory-tested at full load
- Detailed instruction book
- Unconditional two-year guarantee

MUNNING-GREEN RECTIFIERS

. . . Best in the World!

EXCLUSIVE SOURCE:

MUNNING & MUNNING INC.

202-208 EMMET STREET, NEWARK, N. J.

(Sales offices and distributors in principal cities)

Article References

Most of the articles listed here may be obtained by writing to the publication. Addresses are included for the reader's convenience.

Compiled by Wm. Tucker
Eastman Kodak Co., Rochester, N. Y.

73. ABRASIVES

a. *ABRASIVES, THEIR USE IN SURFACE PREPARATION*
P. C. Bardin
Industrial Finishing, V. 31, p. 44 + 4 pages, April 1955

b. *FELT IN METAL FINISHING*
L. D. Gruberg
Steel Processing, V. 41, p. 237–240, April 1955

74. ALUMINUM FINISHES

a. *BRIGHT-DIP LINE FOR ALUMINUM OR BRASS*
Steel, V. 136, p. 108–109, May 2, 1955

b. *THE EFFECT OF HARD ANODIC COATINGS ON THE FATIGUE STATE OF DTD 364 B ALUMINUM ALLOY*
Savage, Sampson and Curran
Technical Note No. MET200, June 1954, Royal Aircraft Establishment, Ministry of Supply, London, WC2 (Available on loan from the National Advisory Comm. for Aeronautics, Washington 25, D. C.)

c. *SURFACE TREATMENT AND FINISHING OF LIGHT METALS —PART VI—ANODIZING ALUMINUM*
S. Wernick and R. Pinner
Metal Finishing, V. 53, no. 6, p. 91–98, June 1955

75. CHROMIUM

a. *APPLYING DIRECT CHROMIUM PLATE ON ZINC*
Precision Metal Molding, V. 13, p. 53–54, May 1955

76. CLEANING, DEGREASING AND PICKLING

a. *INSTRUMENTATION: CONTROLLED MEASUREMENT LOWERS PICKLING COSTS*
C. H. Krouse
Iron Age, V. 175, p. 132–134, April 7, 1955

b. *CLEANING AND PREPARATION OF STEEL PRIOR TO FINISHING*
Stove and Appliance Builder, V. 20, p. 72–77, April 1955

c. *COMPARATIVE CLEANING BY DIPHASE CLEANERS AND ALKALINE SALTS*
Lloyd Osipow, Herbert Pine, Cornelia T. Snell and Foster Dee Snell
Industrial and Engineering Chemistry, V. 47, p. 845–847, April 1955

d. *COLD SOLVENT DEGREASING*
Bernard Baer
Organic Finishing, V. 16, No. 6, p. 18, June 1955

77. CORROSION

a. *SOME CORROSION INHIBITORS —A REFERENCE LIST*
Corrosion, V. 11, p. 65–67, April 1955

b. *FACTORS AND PREVENTION OF CORROSION*
C. L. Hibert
Aero Digest, V. 70, p. 22–31, April 1955

c. *TITANIUM REFERENCE SHEET. II*
G. E. Hutchinson
Chemical Engineering Progress, V. 51, p. 38, April 1955

d. *HIGH TEMPERATURE CORROSION DATA*
Corrosion, V. 11, p. 241–245, May 1955

e. *SMART CONTROL OF HUMIDITY LICKS METAL CORROSION DURING IN-PROCESS STORAGE*
A. M. Beebee, Jr.
Power, V. 99, p. 110–111, May 1955

78. DATA

a. *CORRELATION LIST OF AMERICAN AND EUROPEAN COMPOSITION OF STAINLESS STEEL (PAMPHLET)*
Report No. PB 111549. 12 p. 1954, Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. $0.50

79. ELECTRICAL

a. *ELECTRIC EQUIPMENT FOR ALUMINUM ANODIZING*
D. C. Griffith
Electrical Engineering, V. 74, p. 384–387, May 1955

80. ELECTROPLATING—GENERAL

ELECTROPLATING ON MAGNESIUM
H. K. DeLong
Metal Progress, V. 67, p. 102–108, April 1955

81. FILTRATION

a. *THE USE OF FILTERS IN ELECTROPLATING*
J. B. Mohler and Charles E. Crowley
Electrotypers and Stereotypers Magazine, V. 41, p. 5 + 5 pages, April 1955

82. HANDLING

a. *PROPER HANDLING DEVICES AID BATCH PICKLING*
W. A. Risher
Iron Age, V. 175, p. 95–97, May 12, 1955

83. MATERIALS

a. *CERROSAFE. LOW TEMPERATURE MELTING ALLOY*
Alloy Digest, No. PB-2, May 1955

84. SURFACE

a. *A RE-EVALUATION OF SURFACE FINISH*
L. Chaney and C. H. Good
American Society of Mechanical Engineers, Paper No. 54—A-192, 1955, 9 p.

85. SURFACE TREATMENTS

a. *THE EFFECT OF CHROMIC AND CHROMIC ACID RINSE SOLUTIONS ON THE DURABILITY OF PAINT COATINGS*
Jodie
Organic Finishing, V. 16, No. 6, p. 7–13, June 1955

86. TESTING

a. *STANDARDIZATION OF CHROMIUM BATH TESTS ON A BENT CATHODE IN THE HULL CELL*
Robert H. Rousselot
Metal Finishing, V. 53, No. 6, p. 99–101, June 1955

87. VACUUM METALLIZING

a. *HIGH VACUUM METALLIZING*
M. Z. Thorsen
Organic Finishing, V. 16, No. 6, p. 14–17, June 1955

Below are listed the addresses of publishers where the reader may send for article references.

Aero Digest
National Press Bldg.
Washington, D. C.

American Society of Mechanical Engineers
29 W. 39th St.
New York, N. Y.

Chemical Engineering Progress
25 W. 45th St.
New York 36, N. Y.

Corrosion
M & M Bldg.
Houston 2, Texas

Electrical Engineer
500 5th Ave.
New York 36, N. Y.

Electrotypers & Stereotypers Magazine
Leader Bldg.
Cleveland 14, Ohio

Industrial & Engineering Chemistry
430 Park Ave.
New York 22, N. Y.

Industrial Finishing
1142 N. Meridian St.
Indianapolis 4, Ind.

Iron Age
56th & Chestnut Sts.
Philadelphia, Pa.

Metal Finishing
381 Broadway
Westwood, N. J.

Metal Progress
7301 Euclid Ave.
Cleveland 3, Ohio

Organic Finishing
381 Broadway
Westwood, N. J.

Power
330 W. 42nd St.
New York 36, N. Y.

Precision Metal Molding
1240 Ontario St.
Cleveland 13, Ohio

Steel
Penton Bldg.
Cleveland 13, Ohio

Steel Processing
House Bldg.
P. O. Box 477
Pittsburgh 30, Pa.

Stove & Appliance Builder
Shoreham Hotel
Washington 8, D. C.

"we refer to the chrome plated fire hydrant....

• • • in front of the Portland, Oregon beauty shop, whose operator felt that an ordinary plug just wasn't glittery enough." ***(from the Baltimore Sun)***

"Just what is it, we would like to know, that makes shiny chrome an adjunct to civilized existence? Almost everywhere you look, everywhere you go, chrome plate gleams . . . from key ring to automatic toaster, from ball point pen to cocktail shaker the idea seems to be, Brother, you aren't living unless it's chrome plated."

The answer is that chromium provides much more than a distinctively pleasing appearance. It protects metals against tarnish, corrosion and mechanical wear. It is not easily scratched. It is unaffected by heat, smoke, grease. It prolongs the useful life manyfold. Original lustre is restored by wiping. There are also engineering reasons such as low coefficient of friction.

Whatever your requirements are for Chromium Chemicals — to plate fire hydrants or to plate diesel engine cylinder liners — you will find Mutual a reliable source of supply.

SODIUM BICHROMATE • CHROMIC ACID • POTASSIUM BICHROMATE

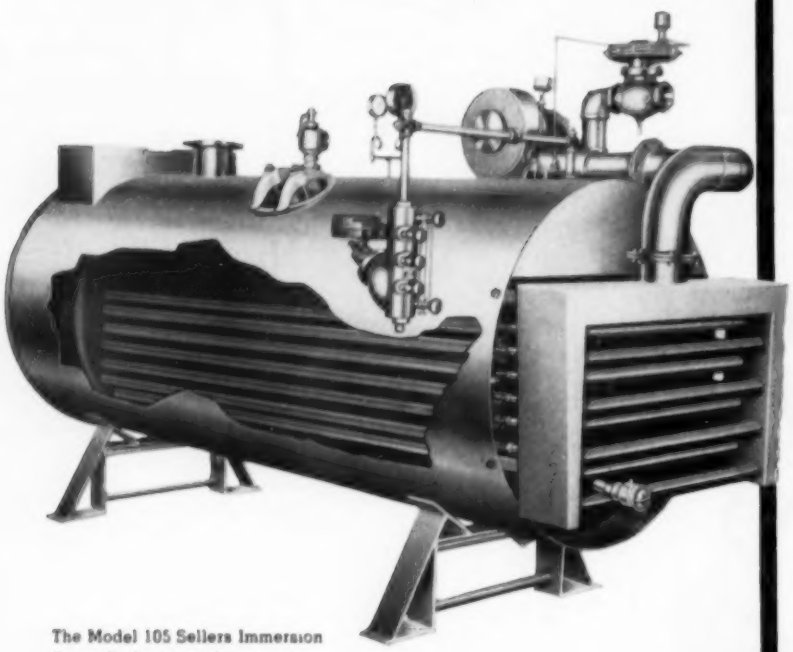
MUTUAL CHEMICAL DIVISION

MUTUAL — ALLIED CHEMICAL & DYE CORPORATION

99 PARK AVENUE • NEW YORK 16, N. Y.

There's a good reason why

SELLERS BURNS GAS "INSIDE THE WATER"



The Model 105 Sellers Immersion Steam Boiler is another steam boiler designed and built with totally submerged and horizontally located firing tubes.

This system of firing permits all gas to be burned inside the submerged tubes — and therefore *inside the water.*

Every tube is an individual combustion chamber with its own burner — *completely surrounded by water.* This is the most efficient method ever devised.

And this system permits "spreading out the fire" — to put every square foot of heating surface to work, increasing life, internal circulation, and operating efficiency.

The Sellers Model 105 Immersion Steam Boiler is only one of a complete line — all are companion boilers to the famous Sellers Model 46. Investigate this line — there is one to fit your requirements.

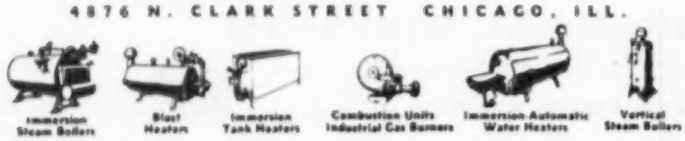
BEFORE YOU BUY ANY STEAM BOILER, CONSIDER THESE FACTS

- ***MINIMUM SCALE PROBLEM***
  Intermittent firing of the boiler brings about alternate expansion and contraction of the firing tubes which loosens scale which might form on the tubes. This scale drops to the bottom of the shell out of the firing zone and cannot bake on to the firing tubes. Clean out openings are provided.
- ***CONTINUED HIGH EFFICIENCY***
  As long as firing tubes are kept clean, original high efficiency is economically maintained.
- ***NO WATERLINE CORROSION***
  With all firing tubes totally submerged, there is no corrosion at the waterline—where tubes normally fail. In Sellers immersion type steam boilers, there can be no waterline corrosion.
- ***MORE EFFECTIVE INSULATION***
  More effective insulation is possible because the insulation is against heat loss from low temperature steam and water instead of a high temperature combustion chamber.
- ***FASTER STEAMING AND DRYER STEAM***
  Rapid steaming and dry steam takes place because of the large surface area of the water. All surface water is heated first since the firing tubes are located close to the water line.

Sellers

ENGINEERING COMPANY

4876 N. CLARK STREET CHICAGO, ILL.



Save Dollars Now!

SELLERS ENGINEERING COMPANY
4876 N. Clark Street
Chicago, Illinois

☐ Please send us complete information on the Sellers 105 Model Steam Boiler.
☐ Send us the Tell-All folder on the Sellers complete line of steam boilers.

Name_____

Company_____

Address_____

City_____ State_____

Dept._____

Platers get improved chromate finishing

How to take better action against plating plant corrosives

Two groups of chemical resisting coatings can handle almost any application in plating plants.

Unichrome Plastisol Compounds can now be applied to any metal surface which can be uniformly baked. This has been made possible by Coating 5300, the first practical *sprayable* plastisol. It builds a protective film 20 mils thick in one coat, or thicker in multiple coats.

Combining the chemical inertness of vinyls with the pore-free, seamless, and mechanical protection of its resilient thick film, Coating 5300 can do many jobs for which sheet materials are used, and at less cost. Objects of dippable size can easily be protected with plastisol Unichrome Coating 218X, which so many plants already have on hand for coating racks.

Protection applied like paint

Various UCILON* Coating Systems because they're applied like paint, can do many jobs that plastisols cannot do, especially on large structural work. Ucilon Coatings include vinyl, phenolic, fish oil, neoprene, Thiokol, and chlorinated rubber types.

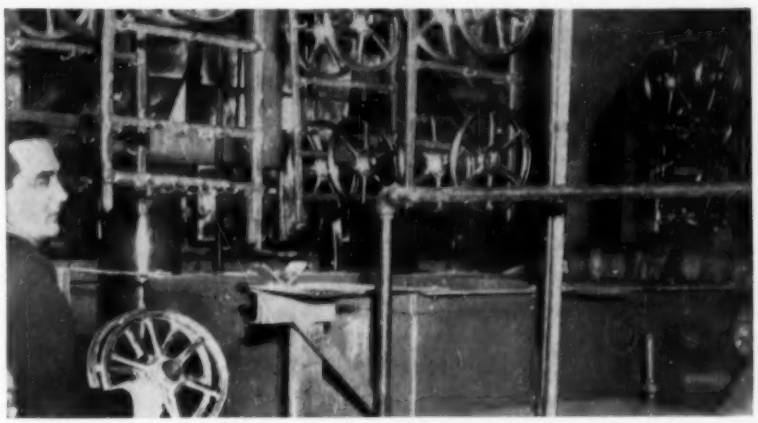
These coatings are intended for the kind of severe service conditions, high humidity and strong chemical solutions common to plating plants. They stand up, and keep the shop looking better longer . . . and for less money in the long run.

**Trade Mark*

UNITED CHROMIUM DIVISION
METAL & THERMIT CORPORATION

100 East 42nd Street, New York 17, N. Y.
Waterbury 20, Conn. • Detroit 20, Mich.
Chicago 4, Ill. • Los Angeles 13, Calif.
In Canada:
United Chromium Limited, Toronto 1, Ont.

Matching of process to requirements simplified with wide line of Unichrome Dips



Economical, clear chromate finishing is being assured at the plant shown here because the chromate dip is matched both to the product and to the method of operation.

During chromate treating of zinc, the solution not only creates a corrosion resistant finish, but also strips away some of the zinc and chromate finish just formed. This chemical activity determines thickness of the finish, and therefore its corrosion resistance. It governs color and eye appeal, as well.

Composition of the chromate solution used and the time it has to act on the zinc affect results. Even the shape of the work can affect uniformity of results. The problem then is to get the one right solution for the operation.

THE RIGHT SOLUTION

Platers have found that satisfaction in chromate finishing is assured when the process matches the needs of the product being treated and the production setup.

The unusually wide line of Unichrome Dips permits excellent matching to satisfy all requirements — corrosion resistance, eye appeal, color, type of equipment and the operating cycle.

SOLUTION ECONOMY

Chromate solutions contain various ingredients — some to control the solution, some to form the finish. But it is the chromating material which actually does the work. More chromate, more work done.

Unichrome Dips contain the optimum amount of the actual working material with just the right balance of control ingredients. That is why users are able to report materials savings, smaller additions for maintenance of concentration, longer service before discarding, and low cost per sq. ft. of finish.

Contact the nearest office of United Chromium for a chart of all the Unichrome Dips available, with the specifications they meet, and the colors they produce.

PLA-TANK®

Chosen for 3200 gallon

CHEMICAL STORAGE TANKS

Here are four 3200 gallon chemical storage tanks ready for shipment to Kuehne Chemical Company, manufacturing chemists in Elizabeth, N. J. These are the largest PLA-TANK tanks ever manufactured – 8′ 4″ diameter, 8′ 4″ deep with slanting bottoms for drainage.

Pla-Tank offers many advantages

The tanks are used for storing a 20% sodium hypochlorite bleach solution. PLA-TANK was chosen in preference to rubber-lined steel tanks for several reasons.

- **PLA-TANK** is manufactured from long-life, resin-bonded glass fiber laminate, offers a solid uniform material. No blister or peel. Equal protection on the outside against spillage.
- **PLA-TANK** is light weight, easy to install; needs less rigging and support; saves on handling, freight and shipping charges. These tanks weigh approximately 800 lbs. each, about ¼ the weight of rubber-lined steel.
- **PLA-TANK** is resistant to a wide variety of acids, fumes and temperatures.
- **PLA-TANK** prices compare favorably to rubber-lined steel.
- **PLA-TANK** could be the answer to your tank installation problem. Let us help you the modern way – with **PLA-TANK**. Also available: stacks, hoods, ducts.

Send for free data sheets

PLA-TANK, INC. DIVISION OF THE *Chemical* CORPORATION

Dept. 87, West Warren, Mass.

Mail Box

Sirs:

"I am sure you did not mean to imply in your May editorial that our research at Michigan State College on plating wastes is sponsored by the AES. This research has been from the beginning sponsored by the National Institutes of Health of the U. S. Public Health Service. Your editorial on the subject of water pollution is certainly welcome as the problem is of increasing interest these days."

C. Fred Gurnham, Head
Michigan State College,
Dept. of Chemical Engineering

(We did not mean to imply in our May editorial that plating wastes research at MSC was being sponsored by the AES. We pointed out, however, that "projects on water treatment and waste disposal are now in progress at Yale University and at Michigan State College." Certainly, the only AES-sponsored project on waste disposal is located at Yale University under the direction of Prof. B. F. Dodge.—Ed.)

Cretan Goblets

Athens, June 23, 1955

Mr. Kovatis:

This is the history and description of the two goblets I am sending you.—

A great part of the originals was found during Schliemans' excavations (in the tombs of the Mycenaean Kings 1000 and 3000 B.C.), other during later investigations made in various places by Ch. Tsundas and others. They now are in the National Museum in Athens. But a collection of no less value, of the Cretan Museum in Candia, is the fruit of the famous discoveries of A. Evans and others.

The finest productions of the Cretan (Minoan) goldsmith's art preserved to us are the two goblets (3000 and 2000 B.C.) which were found in the tomb of VAPHIO (near the ancient AMYCLAE in Laconia). They depict scenes from country life. The one represents bulls, which we must imagine living in semi-freedom on an extensive pastureland being caught, one with the help of a net fastened between two trees, while a second has managed to escape and a third actually throws down the man who had mounted on his back in order to break him in, as was still the custom in classic times among the Thessalians. The second cup depicts a bound bull being led away and several oxen in a standing position.

ACHILLES POLLATSEK

Dear Sirs:

Thank you for your kind letter of June 15 and with reference to same, we are pleased to advise that the permanent Sustaining Membership plaque has been received.

We want you to know we appreciate receiving this very attractive plaque and have placed it on display in our offices. We believe it attracts more attention than the old type scroll and like the idea of its being permanent rather than the scroll which had to be replaced each year.

With every best wish for your continued success in your research program, we remain,

RAMSAY M. BELL
Technical Manager
Hammond Machinery Builders
Kalamazoo, Mich.

TRICKS OF THE TRADE

Rinse Effectively, Yet Save Water

By STAN BEYER

For thorough rinsing, fresh water should be introduced at the bottom of the rinse tank opposite a full width dam-type overflow. This procedure is commonly followed with valves wide open, which gives excellent rinsing but is wasteful of water.

To obtain effective rinsing and save water, a syphon breaker and air agitator should be installed in the water inlet line approximately 12 inches above the tank. Syphon breakers and air agitators, working on the venturi principle, discharge air at the bottom of the tank, agitating the water, providing effective rinsing, and reducing the amount of rinse water required. They are available commercially at a very nominal cost.

CLEANING SPECIALISTS

give you a "brighter" outlook on life.

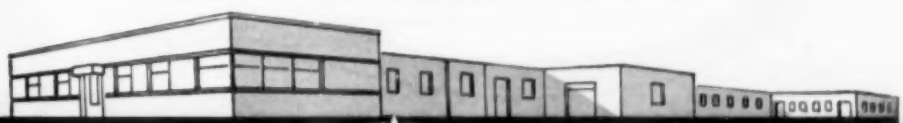
It's amazing how pleasant the view can be after one of these steel-nerved, sure-footed, alert Cleaning Specialists have done their job.

Northwest's Metal Cleaning Specialists are "alert" to your problems when it comes to giving your products a "brighter" outlook. Day in—day out, Northwest carries on the constant search for better, lower cost, analytically-correct cleaners to give you dependable, good looking, permanent finishes.

Remember —YOUR COST PER FINISHED ARTICLE IS THE TRUE COST OF YOUR CLEANER

From Northwest's years of experience in developing job-adjusted cleaners for your specific needs have come such processes as the LO-HI pH—for cleaning prior to plating, painting or vitreous enameling; ALKALUME—for preparing aluminum for finishing and spot welding; INTERLOX—for phosphate coating; SPRA-LUBE—to control over-spray of "today's" paints in water wash paint booths; PAINT STRIPPERS—specific to your needs; SUPER-DRAW & FLUID FILM—for drawing metals.

Northwest's production-tested chemicals and "Right-the-first-time" recommendations will save you money. Northwest Service is as close as your phone.



NORTHWEST CHEMICAL CO.

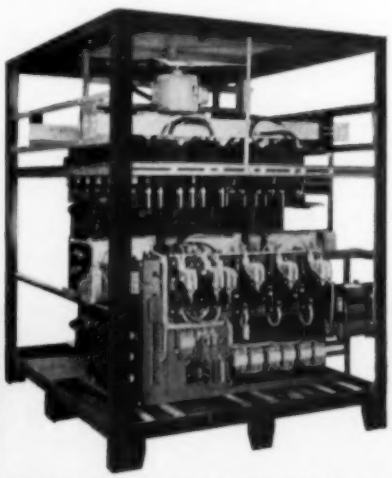
9310 ROSELAWN DETROIT 4, MICH.

pioneers in pH cleaning control *serving you since '32*

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 854.

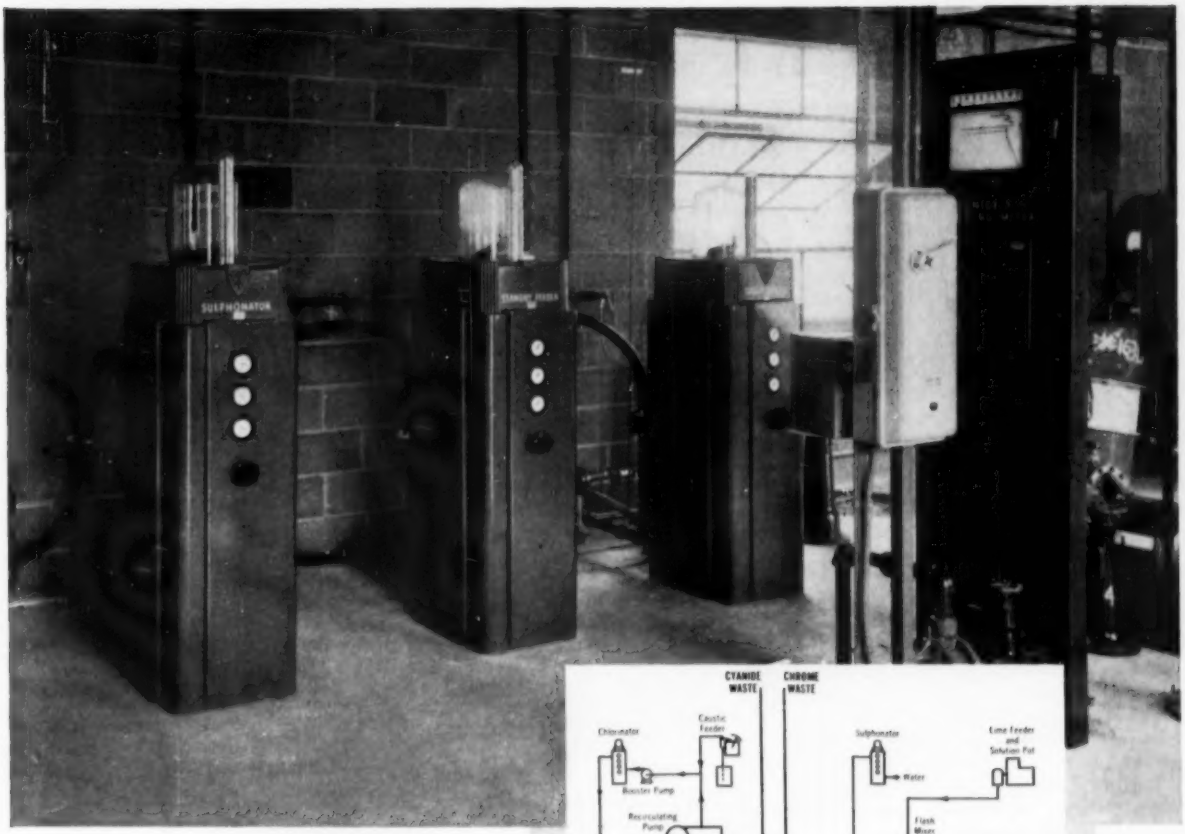
Accurate Diagnosis . . . Proper Prescription . . .

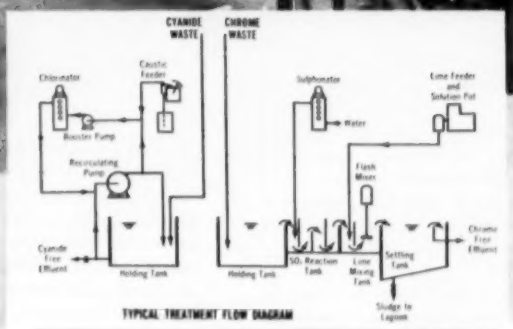
When a rectifier "case" comes to Richardson-Allen, top flight engineers confer and diagnose the problem with the thoroughness of leading physicians. The proper rectifier is prescribed and then custom made at production prices to suit your own particular needs. Individualized service keynotes Richardson-Allen's custom relationship . . . manufacturers of the finest in rectifiers—selenium, germanium, etc. Write today for complete information.



RICHARDSON ⚡ ALLEN
CORPORATION
DEPENDABLE RECTIFIER SPECIALISTS

a manufacturing affiliate of **WESLEY BLOCK AND CO.**, 39-15 MAIN STREET, FLUSHING, N. Y.
IN CANADA: Richardson-Allen of Canada, Ltd., 370 Victoria St., Toronto, Canada





TYPICAL TREATMENT FLOW DIAGRAM

DAYSTROM INSTRUMENT DIVISION USES

W&T *Cyanide & Chrome Waste Treatment*

The Daystrom Instrument Division of Daystrom, Incorporated, located at Archbald, Pennsylvania, has provided a compact and efficient treating plant to destroy the toxic components of their plating waste. The treatment plant has been in continuous operation since 1953.

The cyanide bearing waste is treated with chlorine and caustic, using a W&T Water Diaphragm Chlorinator and a W&T Chemical Solution Feeder. The treatment breaks down the cyanide to harmless carbon dioxide and nitrogen gas components.

The chromium bearing waste is treated with sulphur dioxide and lime, using a W&T Sulphonator and a W&T Dry Chemical Feeder. The treatment removes the toxic chromium and other heavy metals from solution, to be disposed of as sludge.

If you would like more information on Wallace & Tiernan cyanide or chromium waste treatment, write for bulletin RA-2120-CP.

WALLACE & TIERNAN INCORPORATED

25 MAIN STREET, BELLEVILLE 9, NEW JERSEY

I-52

Books

Order all books AES, 445 Broad Street, Newark, N. J. Please remit check or money order.

ASTM Proceedings (1954). 1400 pp. $12.00 to nonmembers, $10.80 to members.

The 1954 edition of the *ASTM Proceedings* has recently been published. The 1400-page volume records the technical accomplishments of the American Society for Testing Materials for the year 1954. It includes many technical reports and papers together with discussion which has been offered to the Society during the year and accepted for publication in the *Proceedings*.

Leading the volume is the Summary of the Proceedings of the 57th Annual Meeting, held in June 1954, listing by title and author the program for each of 36 sessions. The Annual Address by President L. C. Beard, Jr., entitled "Plain Talk" follows in which he speaks out against the breakdown in communications among scientists, engineers, and management urging a return to simple language which will make scientific matters clear to those with only a relatively elementary scientific background.

Reports of the technical committees, of which there are 68, and their appendices provide a wealth of useful technical information as do the 37 technical papers and discussions on a wide variety of subjects pertaining to research and testing of materials.

In addition to the papers and reports embodied in the *Proceedings*, there are listed in the table of contents all symposiums published separately as Special Technical Publications (STP's) and all papers published in the *ASTM Bulletin*.

Although the Society's publications program has expanded much in recent years, the *Proceedings* remain the repository of factual information and a record of the Society's work.

It should be emphasized that in addition to reports and technical papers, many of which have been given at the Society's Annual Meeting and some of which have been preprinted, the *Proceedings* contain much discussion that has been submitted and not previously published.

Titanium in Iron and Steel by George F. Comstock. (John Wiley and Sons.) 294 pp. $6.00 to nonmembers, $5.10 to members.

The new book reviews and correlates all the important published data on titanium as an alloying element in iron and steel. Nearly 300 papers, all listed in the 15-page bibliography at the end of the book, were scrutinized for material that would be of value to the metallurgist, steel worker, foundryman, and engineer.

Starting with a general discussion of titanium and its minerals, and including the details on principal sources, concentration, preparation, and related fundamentals, the book proceeds to the working aspects of titanium. Full chapters are devoted to titanium as a deoxidizer in rimmed and killed wrought steels, the effects of titanium on nitrogen and sulphur in steel, titanium in cast steel and cast iron, general effects of titanium as the sole alloying element in pearlitic steels, and titanium in low-alloy steels. The concluding chapters cover carbide stabilization by titanium in unalloyed steels or steels of less than 4 per cent alloy content and in steels containing over 4 per cent chromium, and titanium in precipitation-hardening steels and in complex heat-resisting alloys.

As in the first two monographs of the series, both fahrenheit and centigrade temperatures are given. In the discussion of properties, the book follows closely the recommendations of such organizations as the American Society for Testing Materials, the American Society of Mechanical Engineers, and the American Standards Association.

Comstock is a consultant to the Titanium Alloy Division of the National Lead Company, with over forty years of experience in the field of titanium alloys. Published for the Engineering Foundation, the book joins *Nickel in Iron and Steel* by A. M. Hall and *Aluminum in Iron and Steel* by Samuel L. Case and Kent R. Van Horn, published respectively in 1954 and 1953. Frank T. Sisco is editor and director of Alloys of Iron Research.

Is Your Dryer A BUCKING BRONCO?

In order for a centrifugal dryer to stay put it should be heavy. That's why the modern Nobles Dryer is about twice the weight of most dryers. Extra weight is one of the reasons for its stability, its freedom from vibration, its smooth operation, and long trouble-free life.

It's all new in design and principle. A powerful suction fan *draws* the air completely through this modern Nobles Dryer and exhausts it at the bottom! Electric or steam heaters are mounted in the cover of this machine of advanced design for a saving of space and elimination of heat loss.

Air moving equipment isn't an extra. The powerful suction fan is an integral design feature of each machine. A brake pedal extending around the entire work area controls an internal, expanding hydraulic brake for quick, smooth stops.

Why not take the first step now toward modern quick drying and lowest costs?

NOBLES ENGINEERING & MANUFACTURING CO.

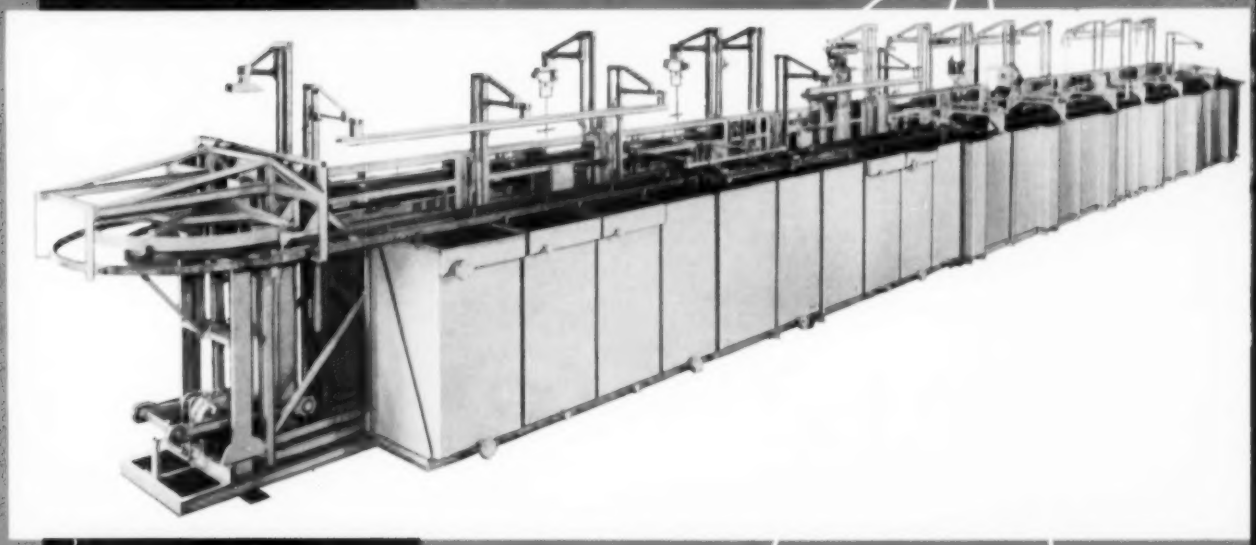
[illegible] EAST SYCAMORE STREET ST. PAUL 4, MINNESOTA

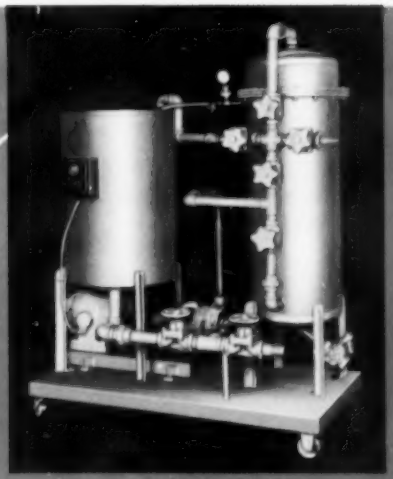
Write Today for the FREE NOBLES DRYER BROCHURE

BULLETIN 355

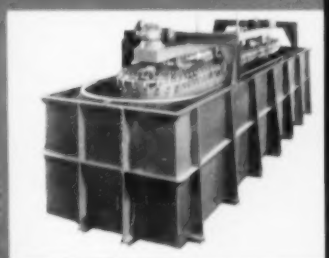
tomorrow's equipment today

WAGNER BROTHERS
automatic plating equipment and supplies





RECTIFIERS
AUTOMATICS
SEMI-AUTOMATICS
FILTERS
TANKS & LININGS
ANODES
WASTE TREATMENT SYSTEMS

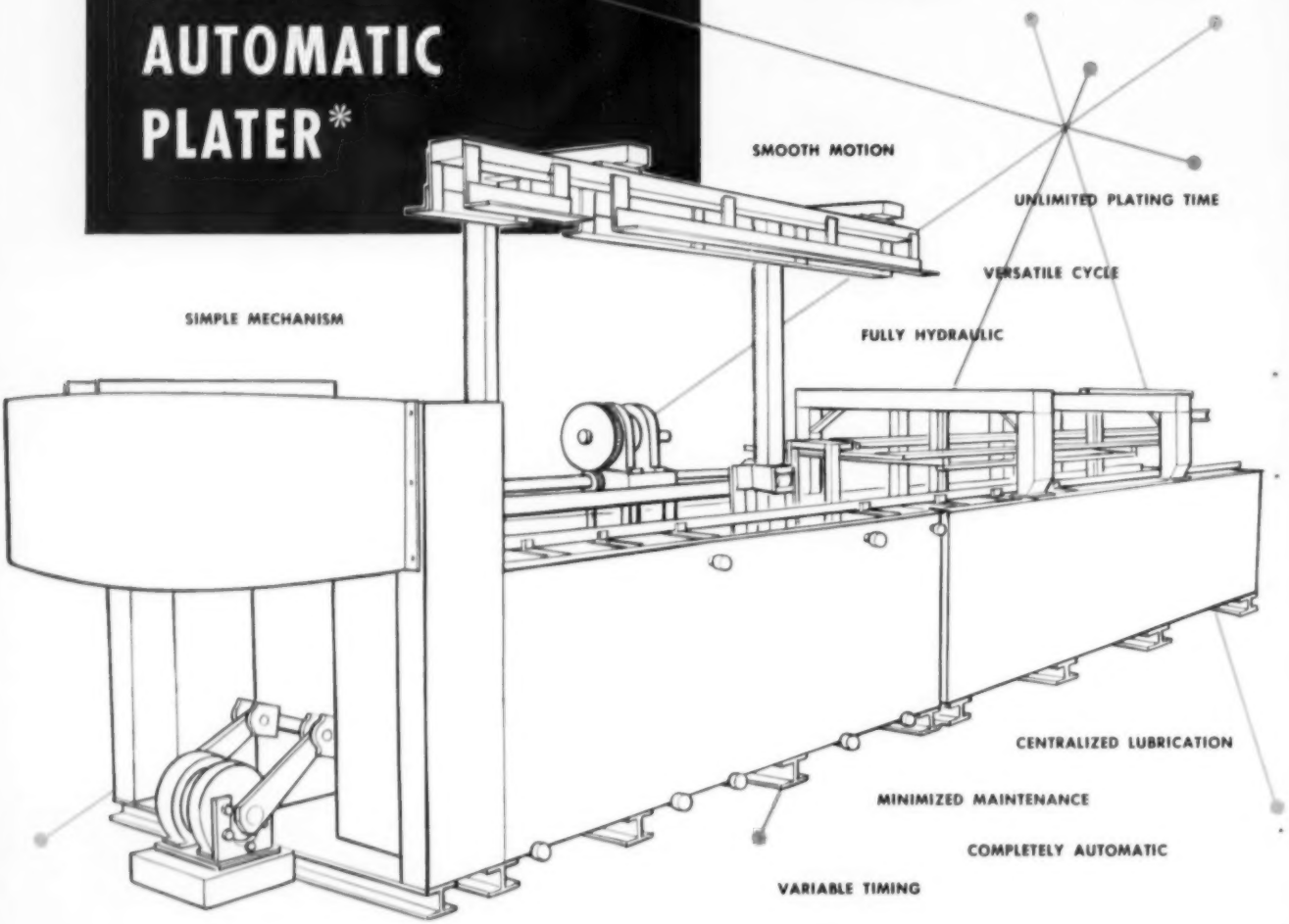


400 MIDLAND AVE. • DETROIT 3, MICHIGAN

Chicago • Rochester • Cleveland • Cincinnati • Indianapolis • New York

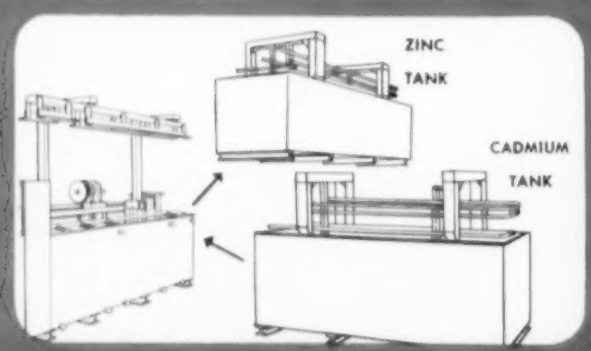
WAGNER BROTHERS *NEW* STANDARD FULLY AUTOMATIC PLATER*

revolutionary concept in plating automation now available to job platers in a standardized model



Automatic operation benefits you by increased production capacity, lowered unit cost and improved quality control—it's faster, cheaper, better.

The *new* Wagner Brothers Standard Automatic now offers you, for the first time, an automatic plater with these *exclusive* advantages:



REPLACEABLE PLATING TANK

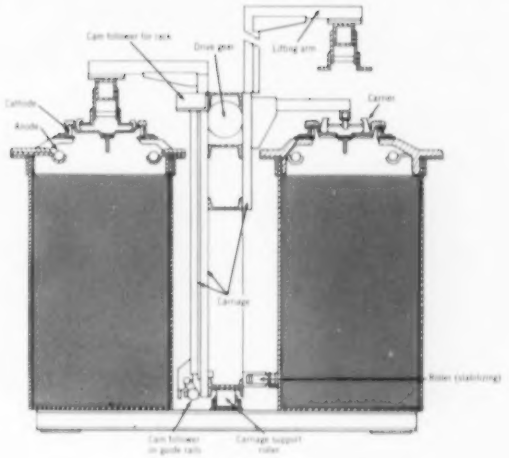
You can *change from plating zinc to cadmium in minutes;* the usual time-consuming tank cleaning operations are unnecessary. Just imagine what you'll save in time and materials. Since all conveying rails are built into the plating tank, you simply pull one tank aside and replace it with a spare. This feature gives you all the versatility of having two automatics.

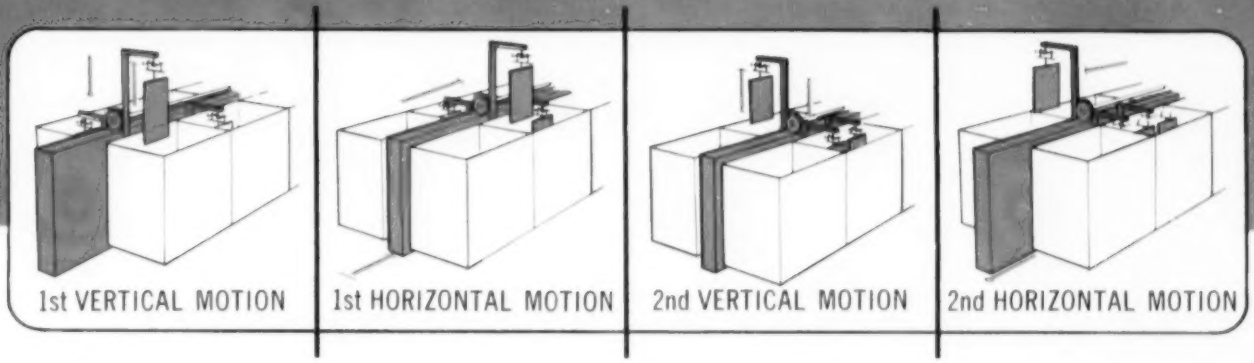
*PATENTS PENDING

FACTS YOU SHOULD KNOW ABOUT SELENIUM RECTIFIERS

SIMPLE TRANSFER MECHANISM

Unique vertical transfer and return type work conveying design efficiently minimizes number of parts, subsequently reduces chances of breakdown. There are no elevating superstructures, transfer cams, chains and sprockets or hydraulic cylinders over tanks. The carriage is motivated by a hydromotor mounted at the base of the machine, fitted with a crank and link to translate the simple harmonic motion of the motor shaft to the in-line reciprocating action of the carriage.





HOW IT OPERATES — All transfer and conveying mechanism is mounted on a reciprocating carriage located between the two rows of tanks. Two basic motions are used: one forward and reverse horizontal motion of the carriage and a raising and lowering movement of lifting arms attached to the carriage. Plating racks are attached to work carriers at the loading station. When the machine is started, the lifting arms pick up work carriers on one side of the machine, carry them forward to the next station where they are lowered and disengaged. This sequence is simultaneously produced in reverse on the opposite side so that the effect is a balanced work load which requires only low hydraulic pressures.

ELECTRICALLY ISOLATED — The plating tank is a separate unit, electrically isolated from the rest of the mechanism to eliminate possibility of stray currents.

3 POINT CONTACT — The work carrier is designed to give 3 point contact at all times. Constant wiping action on electrified rails keeps contacts clean, assures constant, dependable current flow.

VERSATILE CYCLE — You can have as many as seven stations in both the pre- and post-plating cycle. Tanks are sectionalized at the factory to your particular needs.

SMOOTH PARTS TRANSFER — Our hydromotor power principle *eases* parts through their cycle without jarring them loose from carriers into the tanks.

MINIMIZED MAINTENANCE — All these features vastly minimize maintenance needs: fewer moving parts to wear, no vibration or backlash in automation, no hydraulic cylinders over tanks to contaminate solutions, centralized lubrication, built-in overload protection, working parts easily reached without disassembly, uses only low hydraulic pressures because of balanced work load, and many more.

SIMPLE INSTALLATION — Unit is delivered to your plant intact or in two completely assembled sections. You avoid costly installation.

WRITE NOW FOR COMPLETE TECHNICAL DESCRIPTION, QUOTATION

WAGNER BROTHERS, INC.

400 MIDLAND • DETROIT 3, MICH.

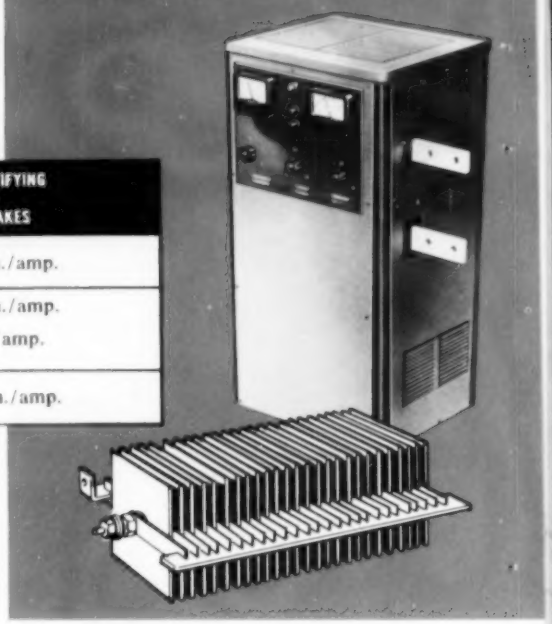
FACTS YOU SHOULD KNOW ABOUT SELENIUM RECTIFIERS

Don't be misled by extravagant claims and technical gibberish about stack rectification areas—

HERE ARE THE FACTS

CIRCUIT	STACK RECTIFYING AREA WAGNER BROTHERS	STACK RECTIFYING AREA OTHER MAKES
3 Phase Half Wave	5.4 sq. in./amp.	3.2-4.5 sq. in./amp.
3 Phase Full Wave (6 Phase)	5.4 sq. in./amp.	3.2-4.5 sq. in./amp. 3-3.7 sq. in./amp. and I.P.T.*
3 Phase Bridge Circuit	8.4 sq. in./amp.	6.0-6.5 sq. in./amp.

*Inter Phase Transformer



On a directly comparative basis, Wagner Brothers Selenium Rectifiers have up to *40% more rectification area* than most competitive selenium rectifiers now on the market—up to 8.4 sq. in./ampere compared with a maximum of 6.5 sq. in./ampere found in competitive models.

WHY MORE RECTIFICATION AREA? — Ample stack area insures higher rectifier efficiency, longer stack life (reduces chances of burn-out), lower temperature rise and ample capacity for overloads.

SUPERIOR STACK CONSTRUCTION — Rectifier cells are selected with the best of electrical characteristics, being made with double collector type assembly to guard against paint between collector contact and the cell which might form either an open circuit or high resistance at the contact. Stacks contain solder type terminals to the bus bar to eliminate possibility of loosening bus bar after hot and cold cycle operation.

LOWER TEMPERATURE RISE — The life of a selenium cell is dependent upon the temperature at which it is operated. The maximum safe operating temperature is approximately 70° C. (158° F.). Wagner Brothers Rectifiers operate with an average temperature rise of only 15° F., thus, in an ambient temperature of 100° F., the temperature will not exceed 115° F.

ADEQUATE OVERLOAD FACTOR — Our tests indicate that the maximum safe operating temperature is not reached until our rectifiers are overloaded to 500% of normal rating. Even in the event of a fan or cooling failure, adequate stack area permits operation of the rectifier without exceeding the maximum safe operating temperature.

HIGHER EFFICIENCY — Since the heat produced in a rectifier represents a loss of power, a reduction of the amount of heat contributes to the substantially higher operating efficiency of the Wagner Brothers Rectifier.

LONGER LIFE — Service life ratings are normally obtained by testing rectifiers during operation with only convection cooling—the anticipated service life being approximately 25,000 hours. Most rectifiers are forced air cooled; the anticipated normal service life is determined generally by increasing the current density 2½ times the convection rating. Wagner Brothers Rectifier service life is based on a current density of 1.6 times the convection rating and permits a use life far in excess of the usual 25,000 hours.

STANDARDIZED STACK DESIGN — All stacks are of a standard design and are interchangeable, either singly or in groups, in all Wagner Brothers standard rectifiers.

BEST INSULATION — Transformers used in our rectifiers are provided with Class B non-flammable insulation (glass, mica, asbestos, etc.) for safety and extra long service life. Transformers are specially designed for electroplating applications.

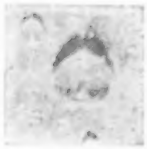
ALSO A COMPLETE LINE OF REGULATORS AND CONTROLS

Write now for free, illustrated Bulletin B 20-54 describing all types of Wagner Brothers Selenium Rectifiers and controls.

LITHO IN U.S.A.

WAGNER BROTHERS, INC.

400 MIDLAND • DETROIT 3, MICH.



Water and Waste

Water is the most abundant compound in nature. Water has proved throughout history to be essential to the advance of civilization. Industry without water would come to a complete standstill. Blessed have been the nations which have had ample water resources.

The forward march of technology and the inexorable advance of science have followed the water trails of the world. Still, such has been the perversity of man that he has raped the land in achieving his technological accomplishments. It is ironic, perhaps, that the same technology and science which raped the land in its growth must now come to the rescue of that same land. But come it will as is evidenced by progress already made.

William Neill of Columbus Metal Products, Inc., and of ORSANCO put it this way in a recent interview, "Water is a natural resource which you can't own. All you can do is borrow it. As a borrower the primary obligation is to return it in pretty much the same condition in which you got it." ORSANCO calls it "good housekeeping." Industry is beginning to call it "good business." It is obviously excellent public relations.

It little matters, actually, how we eulogize about water. Just so long as a single city must do without water because chromium plating waste was dumped thoughtlessly into its supply; just so long as cities must go far away for their water; just so long as entire areas are reduced to shortages; just so long as industry's costs rise because of poor water—just so long do we continue to commit flagrant abuse against ourselves.

In a country which has been blessed with such wonderful water supplies it is shameful that water should become the great problem it has. The answers to this problem are known and can be applied rather simply. The only weakness is the human element. It becomes, in fine, an educational matter.

The most effective tool in this case is the effort being made by industry to guarantee adequate supplies of clean water to itself. Added to this effort we find the manufacturers of water treatment and waste disposal equipment and materials joining their voices to make the public more conscious of the problem. Finally, the government and its great agencies carry out to a logical end the patient explaining, the endless policing, the interminable testing and the tremendous planning that are their bailiwick.

All Water Cut Off In Utica

Chromium Waste Taints Supply

UTICA—The 1,200 residents of Utica were without drinking water Monday night.

The water supply became so heavily contaminated with deadly chromium wastes that health officials ordered all water drinking stopped.

Mayor Donald Havel said he and other city officials had been aware for several days of an increasing volume of chromium poisoning in the Clinton River, from which Utica gets its water supply.

• • •

HE SAID it was believed the wastes were being poured into the river by a chrome plating plant near Pontiac.

Havel said concentration of the chromium began building up Monday afternoon and increased steadily until State Health Department representatives ruled it unsafe.

Every educational medium is aware of the situation. PLATING, therefore, has inaugurated this feature issue in which the problem of water treatment and waste disposal are discussed. Here in these pages are included a symposium, albeit specialized, on the subjects. Here too are to be seen and read the powerful informative messages of our advertisers. Here is a package in which all the agencies of education are represented: Industry, the AES, research, advertising and government.

PLATING points with pride to its past record in the field of water treatment. All the reports of ORSANCO, incorporating the results of AES Research Project No. 2 at Lehigh U., have been published in its pages as have the specialized studies of methods of treating plating wastes. AES Research Project No. 10 deals specifically with "Disposal of Plating Room Wastes." The Director of Project No. 10 is Dr. B. Dodge and its location is at Yale University.

All in all this feature issue is devoted to bringing together as much specially prepared material as is possible on the one subject in one issue. This includes, of course, the manufacturers of chemicals, equipment, supplies, etc. who make possible the economical purification of water and the disposal of industrial wastes.

THE EDITOR

Recovery of Plating Wastes*

By LOUIS WEISBERG† and E. J. QUINLAN‡

This paper describes a plant now treating wastes coming from plating operations in the plant of Channel Master Corporation located at Ellenville, New York. The most interesting feature of this plant is the emphasis on recovering useful waste materials instead of destroying them by chemical treatment, as is the usual practice.

Channel Master Corporation manufactures television antennas. Some parts of these antennas are made of steel. These are plated with zinc from a cyanide zinc plating solution, and then they are given a brief dip in a solution consisting primarily of chromic acid but containing several other acids in addition to the chromic acid.

Wastes from these operations were formerly allowed to mix with wastes from various other cleaning and dipping operations. The mixture was then discharged into nearby Sandburg Creek.

The maximum flow in Sandburg Creek is not always large enough to provide adequate dilution for the quantity of waste that it receives. At times the flow has dropped to a point where serious trouble has developed. As a result, it became necessary to make provision for handling Channel Master's wastes so as to avoid polluting a public water course.

Naturally, the first step in such a program was to find out how much of each kind of waste was involved. The survey was complicated somewhat by the fact that production was expanding so rapidly at the time that estimates and projections had to be revised several times in order to keep in step with the growth in requirements. However, this turned out to be a blessing in disguise, because eventually the entire plating set-up was changed so it became possible to segregate different types of waste and handle each separately.

Wastes are now divided into three classes, which are collected separately and with as little opportunity for mixing as possible. The three types of waste are: (1) chromate, (2) cyanide, and (3) a mixture of miscellaneous acid and alkaline wastes.

Since the acid and alkaline components of the last mentioned mixture tend to neutralize one another, this mixture can be handled rather simply by allowing it to flow to one of two holding tanks (approximately 15,000 gallons each). Here the mixture is neutralized, if and when necessary, by adding acid or alkali to a *p*H between 6.5 and 8.5. It is then allowed to settle until it can be discharged as a clear, neutral effluent. While one tank is being checked and discharged, the other is filling.

The basic idea in handling cyanide and chromate wastes is to recover the values they contain rather than remove them by chemical treatment, as is common practice in the majority of waste treatment installations. Accordingly, two separate, closed circuits were set-up—one for cyanide and one for chromate. Except for accidental contamination, which is negligible in fact, there is no mixing of cyanide and chromate streams and no discharge of either to Sandburg Creek. This ideal solution of the waste problem is possible, of course, only where each type of waste can be kept separate from other wastes and handled by itself. The Channel Master plating set-up has been planned with this in view. While this method of handling plating wastes would not be practicable in many existing shops, there are no serious obstacles to planning new facilities with this method of treatment in view. Such a layout does involve some extra costs. These costs are included in the figures given later in this paper for the total cost of the Channel Master waste treatment installation.

CYANIDE RECOVERY

The cyanide recovery system is based on evaporation of a concentrated rinse produced by four-stage countercurrent rinsing of the plated work coming from the zinc plating tank. The countercurrent rinse set-up consists simply of a four compartment tank as shown in Figure 1. The plated parts are carried through the four compartments in succession while rinse water flows through the tank in the opposite direction.

The expected composition in each compartment for a steady condition can be calculated from a simple material balance, providing the degree of mixing is known or can be estimated. Table I shows the results for a series of such calculations. For "good mixing" it is assumed that the composition of the solution carried out of any given compartment is the same as the composition of the solution remaining in that compartment; this is the ideal case. In the second example, which is designated "half mixing," the composition of the solution leaving a compartment is assumed to lie half-way between the composition in that compartment and the composition in the preceding compartment or tank, as the case may be. "Half mixing" might fittingly be called poor mixing.

The governing factors in the performance of this kind of rinse system are (1) the ratio between the volume or weight of rinse waters, and the volume or weight of water dragged out

†Consultant, 10 East 39th Street, New York 16, New York.
‡Chief Chemical Engineer, Channel Master Corporation, Ellenville, New York.
*Presented at the Annual AES Convention, Cleveland, Ohio. The discussion following the presentation is not included here but will be found in the "Annual Proceedings of the AES, 1955."

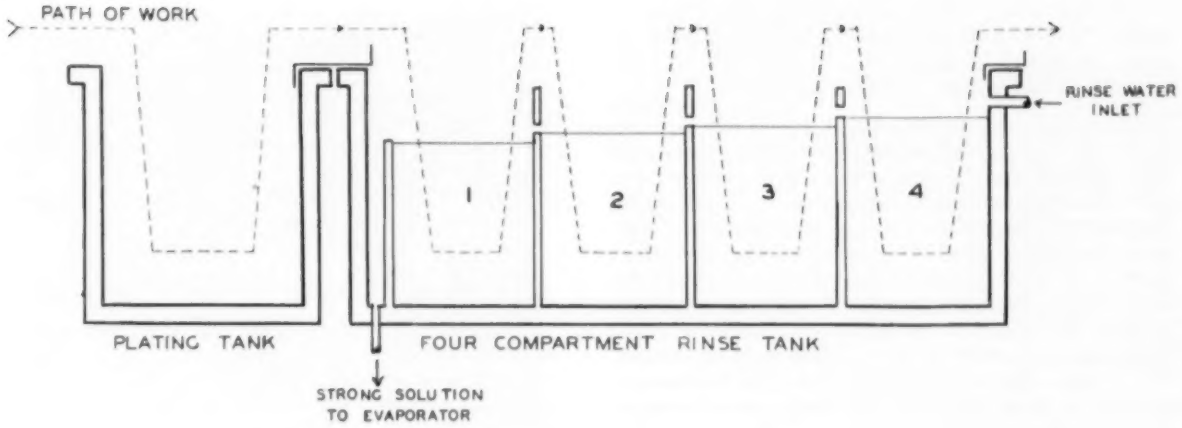


Figure 1. Countercurrent Recovery Rinse System

TABLE I. COMPOSITIONS IN FOUR COMPARTMENT COUNTERCURRENT RECOVERY RINSE (AS PER CENT OF COMPOSITION IN THE PLATING TANK)

	Good Mixing			Half Mixing		
Water Feed Ratio	5	10	20	5	10	20
Compartment 1	20%	10%	5%	19.6%	9.9%	5%
2	4	1	0.25	11.6	5.4	2.6
3	0.77	0.1	0.012	2.7	0.71	0.18
4	0.13	0.01	0.0006	1.0	0.26	0.06

TABLE II. PERCENTAGE RECOVERY OF CYANIDE IN FOUR STAGE COUNTERCURRENT RECOVERY RINSE

	Good Mixing			Half Mixing		
Water Feed Ratio	5	10	20	5	10	20
Compartment 1	80%	90%	95%	40%	45%	47%
2	96	99	99.8	84	92	96
3	99.2	99.9	99.98	93	97	98.6
4	99.8	99.99	99.999	98	99.5	99.9

TABLE III. PERFORMANCE TEST ON COUNTERCURRENT RINSE TANK

Compartment	Cyanide Content (as HCN)	
1	0.286 oz/gal	2145 ppm
2	0.021 oz/gal	157 ppm
3	0.0015 oz/gal*	11 ppm*
4	0.0007 oz/gal	5 ppm

on the work and (2) the number of stages or compartments.

The flow through the countercurrent rinse tank is adjusted so that the volume of rinse water is not far from 10 times the volume of plating solution dragged out of the plating tank on the work. This requires a regulator sensitive enough to handle this small flow, which runs between 1 and 1½ gal/min. It is important to maintain an even flow independent of fluctuations in line pressure. The small amount of water required for this method of rinsing is noteworthy.

Table III shows how rapidly the cyanide content falls off when using countercurrent rinsing. The figures for the first two stages represent averages of 12 separate analyses made on different days. The water feed ratio calculated from these averages is 13.7. No analyses were made on rinse water from the third compartment; the figure given there is an estimate. The cyanide concentration in the fourth stage was determined several times and the figure given in the table is the highest that was found at any time. It is clearly out of line with the other figures, but this may be readily understood from the fact that there is some entrainment in the evaporator.

It is evident that the test was made with parts relatively easy to rinse and with good mixing. Results with tubing, which is used for antenna masts, would be less favorable.

The overflow from the rinse tank goes to a holding tank and from there is fed to a double effect evaporator. Figure 2 shows a schematic diagram of the evaporator arrangement. Two evaporators are shown, connected in series. The solution to be concentrated flows through a preheater (in the foreground, Figure 3) before entering the first evaporator,

*Estimate

i.e. the first effect. Steam at approximately 15 lb/sq in pressure is used in the preheater. A vacuum of about 18 inches of mercury is maintained in the first effect; so the boiling temperature there is not far from 180° F.

The vacuum in the second effect is kept near to 28 inches of mercury. As a result of the second effect's being at a lower pressure than the first, solution flows from the first effect into the second, and more important still, the boiling temperature in the second effect drops to about 115° F. But the water vapor driven off in the first effect has a temperature of about 175° F and so can be used to evaporate additional water in the second effect. The net result of using two evaporators in series this way is to accomplish almost twice as much evaporation per pound of steam used as could be obtained with a single effect evaporator. In fact, when operating to capacity the second effect will save enough steam to pay for itself in about 18 months.

The steam input to the evaporator is regulated by a float type control operating on the solution level in the holding tank previously mentioned. The solution level within the evaporators is regulated by means of an automatic control so that very little attention is required on the part of the operator.

Figure 4 shows a view of the discharge end of the evaporator. The mechanical vacuum pump visible in the foreground has been replaced by a two-stage steam operated ejector. A mechanical pump had to be used when the plant was first put in operation, because the high pressure steam to operate the ejector was not available (90–100 lb/sq in steam pressure is required). Now that such steam has become available the ejector unit is preferred. The horizontal vessel on top of the platform in the foreground (Figure 4) is the main surface condenser. Underneath it is the condensate receiver. The distilled water which collects in the receiver is pumped out automatically whenever it reaches a set level in the tank. This distilled water is used again as rinse water in the countercurrent rinse tank. If make-up water is required, more distilled water is available from steam condensing in the preheater and in the heating coils of the first effect.

Figure 5 shows a close-up of the two evaporator bodies and the corresponding vapor heads.

The distilled water recirculated through the rinse tank may contain small amounts of cyanide as a result of entrainment within the evaporator. To keep entrainment within reasonable limits, the vapor head on each evaporator is equipped with a York mesh demister, which it is believed should hold entrainment to a maximum of 5 ppm. Since all of this water is recirculated and none is discharged to waste, this concentration of cyanide is of no consequence. The small amount of cyanide which is carried out on the work is destroyed in the subsequent chromic acid dip.

The concentrate produced in the second effect has approximately the same composition as the original zinc plating solution. Since this concentrate is under vacuum, it has to be pumped out of the evaporator at intervals; from the pump, it goes into a holding tank, from which it is distributed to various plating tanks as required for make-up.

Sometimes this concentrate contains a small amount of chromate due to accidental contamination. This is taken care of, when necessary, by adding sodium hydrosulfite in the holding tank. The zinc plating solution is treated with sulfide periodically and filtered to purify it, as had been the practice before the cyanide recovery system was installed. Operating results up to this time have shown no appreciable buildup of carbonate or other impurities.

Steam consumption in the evaporator is approximately 90 pounds of low pressure steam (15 lb/sq in) per pound of sodium cyanide recovered. The ejector unit requires about 50 pounds more at a pressure of 90–100 lb/sq in. Cooling water needed for the condensers amounts to about 500 gallons (at 60° F) per pound of sodium cyanide recovered. With steam at $1.00 per thousand pounds and cooling water at 7 cents per thousand gallons, these costs add up to approximately 18 cents per pound of sodium cyanide recovered. This cost covers the zinc and sodium hydroxide recovered at the same time.

The whole system is virtually automatic in operation. The

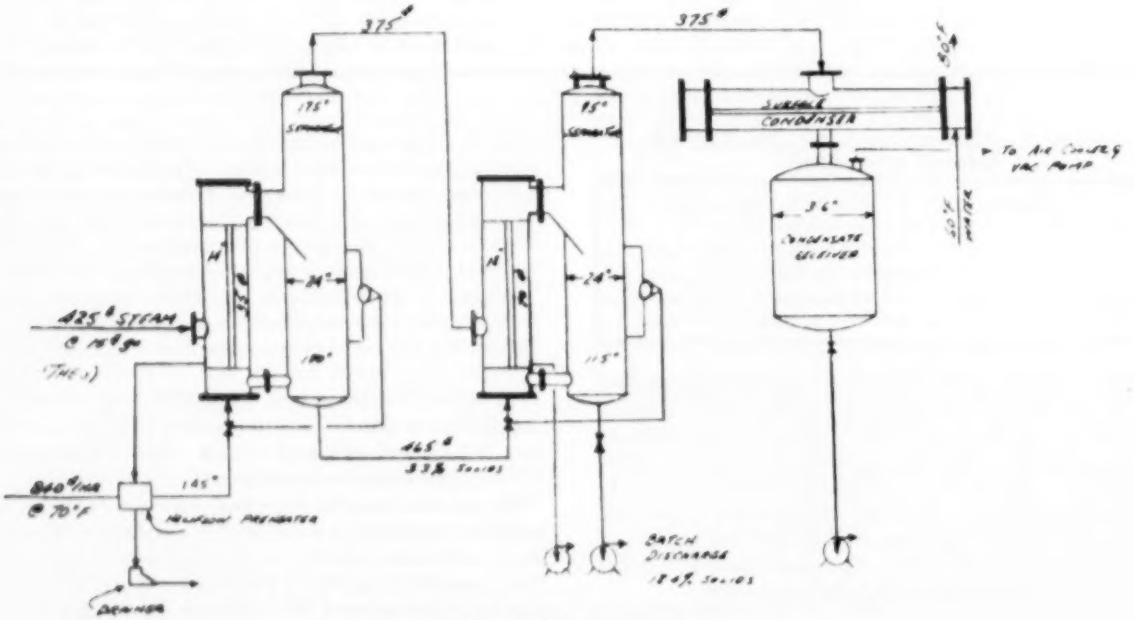


Figure 2. Double Effect Evaporator

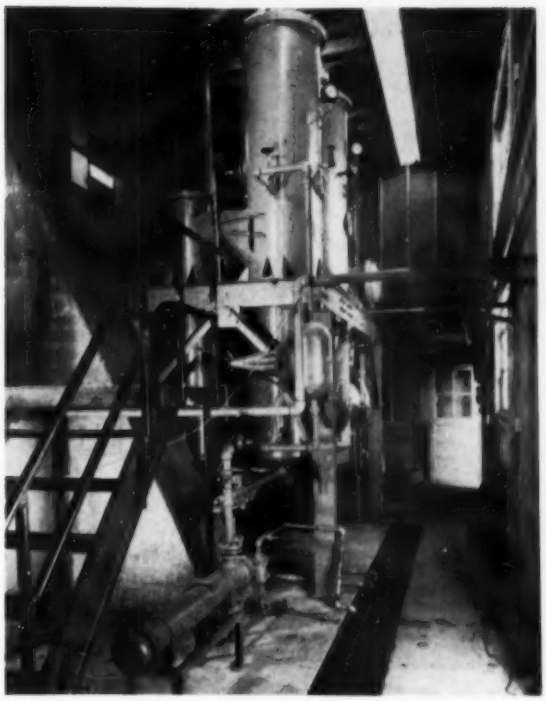


Figure 3. Evaporator: Inlet side, showing first effect and preheater

total labor required per eight hour shift is less than one man-hour.

If cyanide is destroyed by chlorination, the cost for chemicals alone comes to about 60 cents per pound of sodium cyanide destroyed. To this must be added the cost of replacing the sodium cyanide, zinc and sodium hydroxide lost by this method.

The recovery system described above is at present recovering the waste from about 11,000 gallons of zinc plating solution. The maximum capacity of this unit is 160 pounds of sodium cyanide per day.

CHROMATE RECOVERY

The treatment of chromate waste at Channel Master Corporation represents an adaptation of the ion exchange method that has been used in connection with anodizing aluminum by means of chromic acid. The basic scheme for applying ion exchange to these solutions has been described so many times and in so many places[1] that we shall limit ourselves here to describing those modifications in this general scheme which become necessary or desirable in adapting this method to solutions used for applying conversion coatings on zinc-plated steel. The fact that chromic acid acts to dissolve zinc in this case instead of aluminum makes no significant difference. The differences arise in other ways as explained below.

First, however, it may be noted that the cation exchange resin used in the Channel Master installation is of the same type used by Costa[2] in his original work on the removal of metallic impurities from chromic acid solutions. The anion exchange resin, on the other hand, is one of the newer strongly basic resins[3] which has found application in aluminum anodizing. Two anion exchange units have been provided so that rinse water treatment can be carried on 24 hours a day without interrupting production. One anion exchange unit can be regenerated while the second is on stream. One cation exchanger takes care of all requirements.

The ion exchange process accomplishes three principal objectives:

(1) The cation exchanger removes dissolved zinc, trivalent chromium and iron from the chromic acid solution. This saves dumping or bleeding large amounts of chromate dip solution as these impurities accumulate.

(2) The anion exchanger removes substantially all the chromic acid in the rinse water from the chromate dipping operation.

(3) On regenerating the anion exchanger (with sodium hydroxide solution), the chromic acid removed from the rinse water is recovered as sodium chromate. This sodium chromate is converted to chromic acid by passing it through the cation exchanger, and at the same time the rinse water is demineralized so it can be used over and over again.

The chromic acid dip solution is treated by cation exchange at scheduled intervals so as to keep the treated work coming out at optimum brightness and with maximum corrosion resistance.

We have found that satisfactory leaching is more readily obtained with dips that are regularly revivified by cation exchange than with untreated solutions and that the corrosion resistance of the coating appears to be enhanced. We are not able to say to what extent these improvements may be due to the lower level of impurities in the dip solution and to what extent they may be due to the use of demineralized water for leaching.

The solutions used in producing conversion coatings at Channel Master Corporation differ from chromic acid anodizing solutions in two important respects, namely:

(1) The chromic acid concentration is approximately 150 g/l as against 100 g/l or less, and

(2) The conversion solution contains one or more other acids in addition to chromic acid.

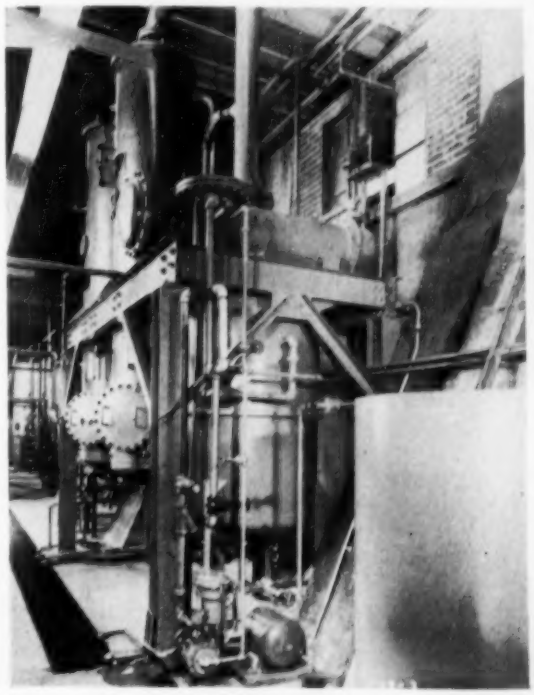


Figure 4. Evaporator: Discharge side, showing second effect

In aluminum anodizing, it is usually possible to recover all the chromic acid at a concentration high enough so that it can be used again without any evaporation. But when a concentration as high as 150 g/l is required, some water has to be evaporated. Dilution is kept within bounds by the use of valves which are controlled automatically by means of a solu-bridge, which is an instrument for measuring electrical resistivity. The yield and concentration of the recovered chromic acid are considerably improved by employing the split regeneration technique recommended by Keating, Dvorin and Calise.[4]

In this procedure, the sodium hydroxide solution used to regenerate the anion exchange resin is split into three portions, which are brought into contact with the anion resin bed in countercurrent fashion. Similarly, the sulfuric acid solution used to regenerate the cation exchanger is split into two fractions which are used in the same manner. This procedure results in some saving of regenerating chemicals as well as an improvement in the concentration of recovered chromic acid.

The amount of water to be evaporated does not add much to the operating cost, but we believe even this amount can be reduced by improved operating procedures. For the time being, the evaporation is being carried out in an open stainless steel tank fitted with a stainless steel heating coil. Parenthetically, it may be noted that we have not encountered any of the severe corrosion problems reported by early workers with decationized chromic acid.[1] It appears that manufacturers of ion exchange equipment have been able to find suitable materials of construction and have overcome most of the difficulties reported in the early literature.

It is not usually recommended to allow cation exchange resin to come in contact with chromic acid solutions containing more than 100–110 g/l. However, the practice at Channel Master has been to bring the solution containing 150 g/l in contact with the cation exchange resin without diluting it first. This reduces the amount of water to be evaporated and apparently produces no harmful effect other than a negligible loss in exchange capacity. The temperature of the solution, however, is kept well below the maximum recommended by the manufacturer; this fact may account for the apparent absence of attack on the resin.

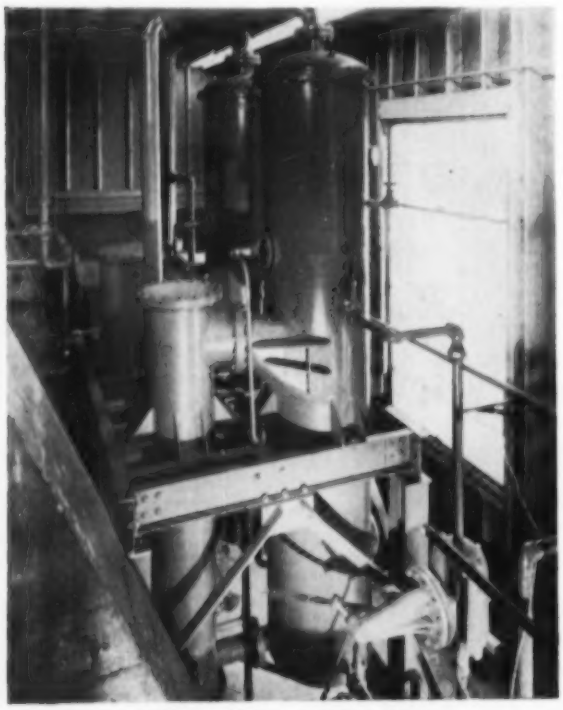


Figure 5. Evaporator: Front view

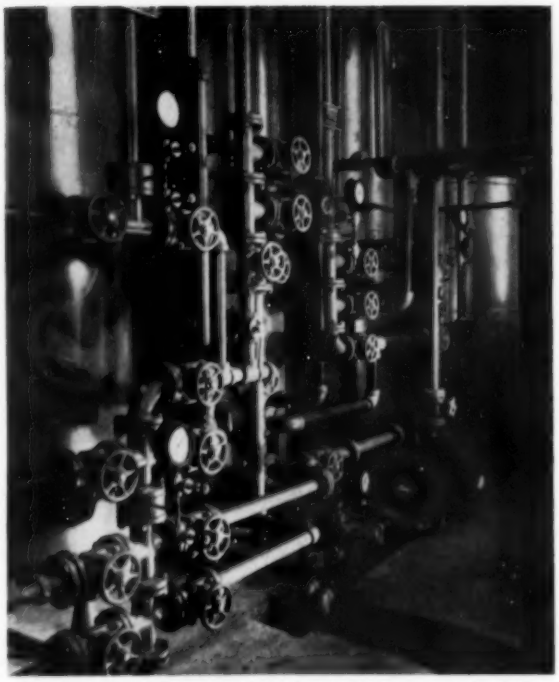


Figure 6. Ion Exchange Unit (Cation Exchanger in the foreground)

The effects resulting from the presence of other acids besides chromic acid must be taken into account. These additions must be present in rather precise proportions in order to produce coatings with the desired characteristics. In addition to the dilution which takes place as the dip solution is used and that which occurs during regeneration and back-washing of the resin bed, the balance within the solution is upset by the fact that some of these added acids form complex cations with trivalent chromium and are taken out along with trivalent chromium by the cation exchange resin.

Working out a satisfactory scheme for the control and replenishment of these additions has proved to be one of the main problems in adapting the ion exchange process to meet the requirements for conversion coating solutions.

Figures 6, 7 and 8 show different views of the ion exchange installation. Operation is manual for the most part; although, as already mentioned, some steps have been set up for automatic control. Full automatic control is feasible but would add substantially to the cost of the plant, especially in an installation as small as this one.

Savings from chromic acid recovery cannot be stated with precision at this time, because the ion exchange unit has not been operating long enough to collect data over a sufficient period. As near as can be estimated at this time, it appears that costs are going to be in line with the figures given in a recent article by Bueltman,[5] except for the added cost arising from the evaporation of excess water. Bueltman points out that recovery of chromic acid from rinse waters by ion exchange is very nearly a break-even operation. The advantage here lies in doing away with the danger of pollution and in

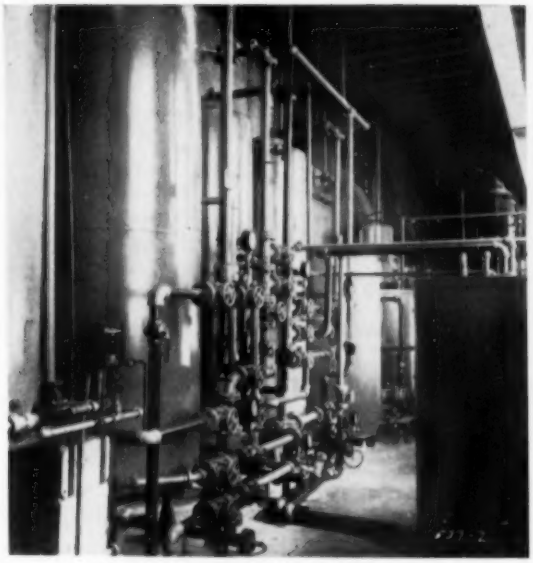


Figure 7. Ion Exchange Unit: Front view

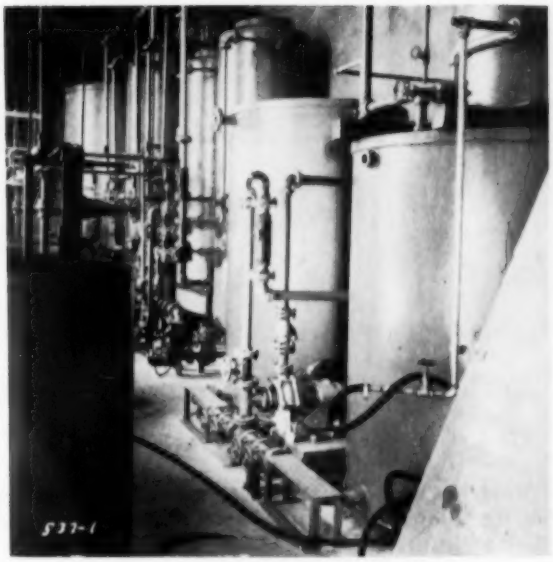


Figure 8. Ion Exchange Unit and auxiliary tanks

producing demineralized water which can be used for rinsing. Treatment of the chromic acid solution by cation exchange, however, results in a handsome saving, even where considerable evaporation is required. This saving at Channel Master Corporation comes to about fifteen hundred dollars a month and is expected to reach two thousand dollars a month when the ion exchange unit is operating at full capacity.

Regeneration of the cation exchange resin yields a solution containing zinc, trivalent chromium and iron together with some sulfuric acid. This solution is neutralized with lime and allowed to settle. The sludge which forms contains a mixture of calcium sulfate and oxides or hydroxides of zinc, chromium, and iron. The clear effluent is run off to waste, and the sludge is dumped.

A report covering more extended operating experience with both the ion exchange unit and the cyanide recovery unit is scheduled for presentation at a meeting of the New York Sewage and Industrial Wastes Association in January 1956.

The floor area occupied by the equipment for cyanide and chromic acid recovery is approximately 80 feet long and 13 feet wide—a total of 1040 square feet. The ceiling height required is 20 feet.

The entire cost, including installation and including those parts of the waste handling system required to classify and segregate the different types of waste comes to approximately one hundred thousand dollars. This is probably no more than it would have cost to install equipment to dispose of Channel Master Corporation's plating by alternative means.

In chlorinating cyanide wastes, the principal cost is for chlorine and sodium hydroxide, rather than for the cyanide destroyed. In treating chromic acid by the usual chemical method, using sodium bisulfite, sulfuric acid and lime, the chromic acid destroyed costs more than the chemicals. In either case, the true cost includes the cost of chemicals used in the treatment as well as the cost of replacing the materials destroyed. On this basis, it can be said that the Channel Master waste treatment plant is yielding a satisfactory return on what it cost instead of being a constant source of expense as most waste disposal plants are.

Finally, no cyanide or chromic acid is discharged to waste in the Channel plant. All legal requirements in regard to pollution have been met.

The authors wish to express their appreciation to Harry Greenberg, chief electrical engineer, Channel Master Corporation, and Harold Harris, vice-president for sales and engineering, for valuable support and advice in this project.

REFERENCES

[1]Kahler, Gilbert and Morrison, Proc. AES 39, 31 (1952).
[2]R. L. Costa, Ind. Eng. Chem. 42, 308 (1950).
[3]Annual Review of Physical Chemistry, Vol. 2, pp. 315-316 (1951).
[4]R. J. Keating, R. Dvorin and V. Calise, Proc. Ninth Industrial Waste Conference, Purdue University, 1954.
[5]C. Buelfman, Metal Finishing 53, 40 (1955).

LOUIS WEISBERG

Weisberg

Dr. Weisberg holds degrees from the University of Texas (B.A., 1912) and Massachusetts Institute of Technology (Ph.D., 1915).

In consulting practice since 1921, his major fields have been electroplating and corrosion of electroplated coatings. He was among those active in introducing chromium plating; invented the cobalt-nickel bright plating process and the 9H semi-bright nickel process (the first level nickel plating solution to come into wide use); developed methods for purifying bright nickel solutions by low current density electrolysis, including methods for continuous low current density purification. The accompanying article summarizes several years' work on the treatment of plating wastes for recovery of cyanides, chromic acid, and other values.

Dr. Weisberg has been active in the AES research organization in various capacities. He was Chairman of the Research Committee in 1948–1949 and received the AES Award of Merit in 1949.

EDMUND J. QUINLAN

Edmund J. Quinlan was graduated from Northeastern University, Boston, Mass., with a B.S. degree in Chemical Engineering in 1936. He has been associated with the plating industry since 1933. Member of the AES since 1941. At present, he is employed by the Channel Master Corporation, Ellenville, N. Y., as Chief Chemical Engineer.

Quinlan

Rinse Water Re-Use By Ion Exchange

Charles Bueltman[1] and A. B. Mindler[2]

Much has been written during recent years describing the role of ion exchange in water treatment for plating baths and rinses, metal recovery and waste treatment. This article is a brief summary, especially from the viewpoint of the re-use of rinse waters after treatment. (See bibliography.)

GOOD WATER

The importance of properly treated water for metal finishing bath makeup and rinsing has been only recently recognized by many in this industry. The savings realized stem from the reduction of rejects, elimination of buffing to remove stains and water spots, less handling of work, better control and improved quality of finished work. These results usually require the use of demineralized, low solids water for both bath makeup and rinsing. Such water may be prepared from raw water passed through a two-step demineralizer or deionizer. However, in many cases deionized running rinse waters, after a save rinse, contain less solids than the raw water available. It is evident that such rinse waters can often be treated for re-use at even lower operating costs than is the case for raw water and at the same time accomplishing other valuable ends.

THE DEMINERALIZATION OR DEIONIZING PROCESS

The main ion exchange process employed in treating plating wastes is the demineralizing process which removes all soluble electrolytes from waters to produce the equivalent of distilled water at a very low cost and with no elaborate equipment or operating attention. A number of modifications of the demineralizing process have been developed during the last 15 to 20 years employing various cation and anion exchange resins to permit the most economical treatment of waters of varying character to the specific degree required.

Basically, the demineralizing process consists of treatment of the water by a hydrogen cation exchanger to convert all salts present to the corresponding acids. These acids are then removed by an anion exchange resin. The type of anion exchange resin employed depends upon whether or not silica and carbon dioxide removal is necessary—the latter often being removed by degasification. By employing the cation and anion exchange resin in a single mixed bed, it is possible to produce demineralized water of extremely low solids content—down to a small fraction of a ppm. The most important demineralization combinations are shown in Fig. 1.

CONCENTRATION OF IMPURITIES

The impurities in plating rinse waters frequently constitute noxious wastes and include such metals as chromate, copper or nickel. By the demineralizing process, these impurities are removed from the water, segregated, and concentrated so that they may be treated as a small volume for suitable disposal, or they may be recovered, if desired, for re-use. This greatly reduces or eliminates completely the amount of waste treatment required before discharging these wastes. Disposal treatment consists merely of neutralization if a small amount of the less noxious metals are present, but precipitation as a metal hydroxide-calcium sulfate sludge must be resorted to if the amounts of metals are high. Chromate in the regenerant wastes must be reduced to trivalent chromium then precipitated as hydroxide for disposal.

Copper and Nickel—Because of the troublesome nature of such sludges and the handling difficulty, it is frequently cheaper and simpler to recover the metal values from the concentrated regenerant effluents of the demineralizing plant. For example, copper and nickel present as cations from acid plating baths are concentrated in the first unit of a demineralizing plant.‡ During regeneration with sulfuric acid the copper or nickel sulfate salts are formed and by proper procedure these metals can be concentrated to 6-8 per cent. They may thus be recovered as the metal by electrolysis or used as the metal salt solution if separate rinses are treated.

Chromate—The incorporation of a "save-rinse" tank will normally conserve from 60 to 90 per cent of the chromate being dragged from the treatment tank. The remaining chromate is still troublesome and requires treatment, as illustrated in Figure 3. Ion exchange offers a very satisfactory solution here as well. Instead of sending the rinse water to treatment and thence to waste, it can be sent through a cation exchanger bed* to convert any chromate salts to acids then through a bed of an anion exchanger,† which has the property of removing the chromate ions from solution and substituting hydroxyl ions.

The treatment of virtually pure chromic acid results in the formation of water in place of the acid. Since the equipment is also capable of operating as a water demineralizer, the rinse tank is initially made up with demineralized water. Hence, when the chromic acid is removed, the water is once again demineralized, and can be returned to the rinse tank for re-use. This conserves on the water, and in some cases where hot rinses (up to about 140° F) are used, the

[1] Of the Permutit Company, N. Y. *Permutit Q or its equivalent. †Permutit S or its equivalent. ‡Fig. 2, the Permutit Q Unit.

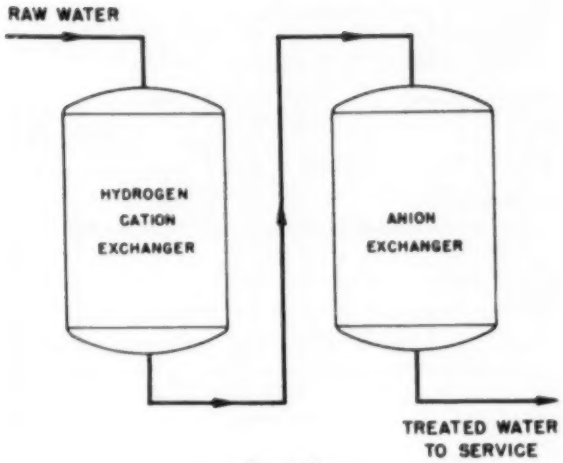


Fig. 1 A

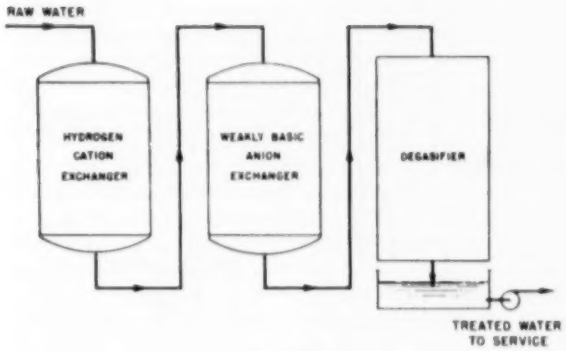


Fig. 1 B

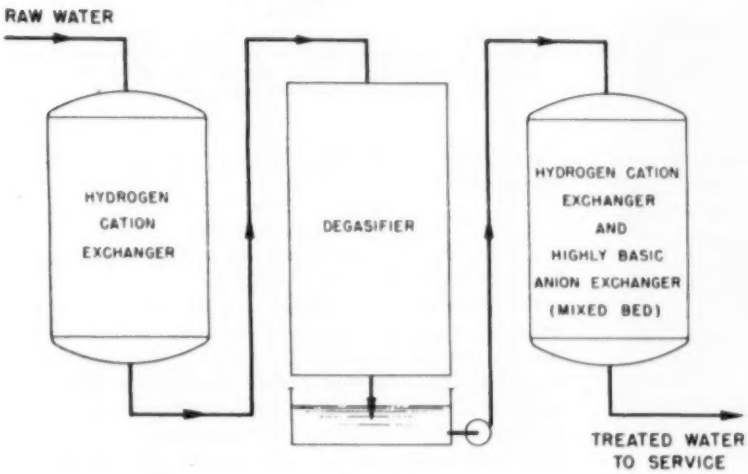

RAW WATER
HYDROGEN CATION EXCHANGER
DEGASIFIER
HYDROGEN CATION EXCHANGER AND HIGHLY BASIC ANION EXCHANGER (MIXED BED)
TREATED WATER TO SERVICE

Fig. 1 C

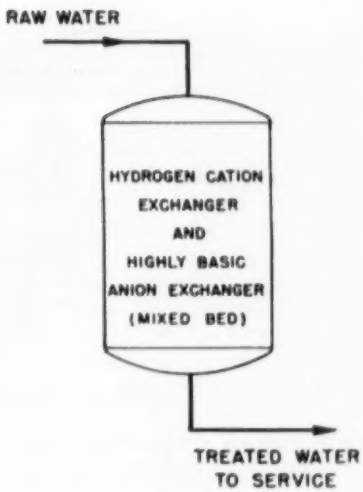


Fig. 1 D

Figure 1
Basic demineralizing system arrangements include: (A) two-step without degasification; (B) two-step weakly basic anion exchange with degasification: (C) demineralization and silica removal—hydrogen exchanger with degasifier and mixed bed unit; (D) mixed bed unit

heat in the water simultaneously offers the manifold advantages of demineralized water for rinsing. The flow rate of treatment may be controlled so that the pH of the rinse tank may be kept at the value which gives the most satisfactory surface.

When the anion exchanger becomes exhausted with chromate, the flow is either halted or shifted to an alternate unit, and the resin is regenerated with caustic soda. The caustic soda drives out the chromate anions and replaces them with hydroxyl anions. The effluent solution from the unit is alkaline containing all of the chromate. For this type of installation, it is only necessary to pass the alkaline regenerant effluent solution from the anion exchanger through the cation exchanger. Here, the sodium ions are removed, forming free chromic acid. This solution can be returned directly to most anodizing and stripping baths, but for return to a plating bath, some evaporation may be necessary.

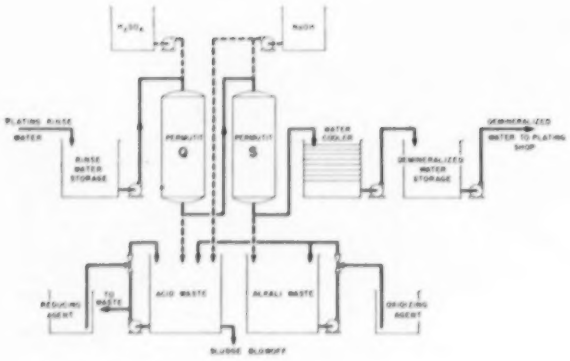
CYANIDE WASTES

The treatment of cyanide-bearing rinse waters from plating operations by ion exchange requires extremely careful study because of the danger of poisoning the ion exchange resin beds. Under certain conditions, it is possible to obtain serious poisoning of the cation exchanger bed due to precipitation of metals as complexes. Such precipitates are often not removed by the acid regeneration of the cation exchanger. Anion exchangers may also be poisoned by the adsorption of tightly adsorbed metal cyanide complexes which are regenerated off the anion exchangers only with difficulty.[5] A third consideration in the application of ion exchange to such waters is the formation of highly toxic hydrocyanic acid (HCN). This requires precaution in the design of the ion exchange plant to eliminate any possibility of escape of this dangerous gas.

If the concentrations of cyanide in a mixed waste are low, they can be treated without difficulty by the conventional demineralizing process and no poisoning effects of the resin are evident. However, if the concentration of cyanide exceeds an allowable limit depending on other contaminants, special pretreatment before ion exchange is recommended. Setting up these limitations requires extensive laboratory work and a thorough background of experience beyond the scope of this review.

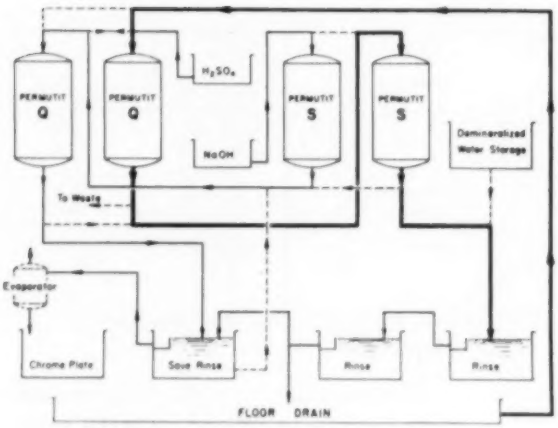
SEPARATION OF RINSE WATERS

It is evident from the widely varying character of the three main types of plating rinse waters that the separation of these



PLATING WASTE TREATMENT

Figure 2
Flow diagram of installation for complete operation of combined water demineralization and waste treatment plant. More than 90 per cent of the water used in this plating shop is recycled



CHROMATE RECOVERY EQUIPMENT

Figure 3
Chromate recovery equipment flow diagram. This is a typical diagram for plating operations. The cation exchange recovery system is incorporated in the plating lines where the rinse conservation tank follows the plating tank

waters into the three categories is mandatory for economical treatment. These three categories are: a. Cyanide-bearing rinses. b. Chromate-bearing rinses. c. Miscellaneous rinses.

While such separation is often difficult and expensive in existing plants, it is readily accomplished in laying out new plants. Even for existing plants where waste treatment is required or imminent or where increasingly frequent water shortages exist, the economies to be derived often justify revamping existing layouts.

APPROXIMATE OPERATING COSTS

Operating Costs ¢/lb-Equivalent of ion removed

Na Cycle Cation Exchange	¢3.84
H Cycle Cation Exchange	7.31
Weak Base Anion Exchange	5.80
Strong Base Anion Exchange	15.25

Based on: Fixed charges of 15%/yr on installed cost

Chemicals

Sodium Chloride (NaCl)	1.50¢/lb
Sulfuric Acid (H_2SO_4)	1.70¢/lb
Soda Ash (Na_2CO_3)	2.25¢/lb
Caustic Soda (NaOH)	4.50¢/lb
Labor	$1.75/hr

Regenerant dosages are generally 1.5–3 times the theoretical chemical equivalent of the impurity removed or exchanged for cation exchangers; 1.25–2 times theoretical for weak base anion exchangers; and 1.5–4 times theoretical for strong base anion exchangers. Ion exchange resin replacement is normally 5–10 per cent of bed volume per year; but since some solutions contain so-called organic and inorganic "poisons" which are adsorbed but not completely removed from the ion exchanger by the normal regenerating solutions, special restoration procedures are sometimes required at intervals. These are generally effective and inexpensive, but in some instances the ion exchangers may be permanently "poisoned" and require replacement more frequently than the rate given above, seldom oftener than once a year.

USE OF COST DATA

A simple example will be followed through step-by-step to illustrate how costs can be applied.

Because of the many variables, costs of installing and operating ion exchange equipment are only approximations. Assume that it is desired to determine whether nickel can be recovered profitably from a nickel plating rinse bath. The flow rate is 140 gal/min (gpm) for 16 hours and nickel, with a density of 8.33 lb/gal, is present to the extent of 150 (ppm) in an acid sulfate solution. The quantity of nickel than is:

$$140 \text{ gpm} \times 60 \frac{\text{min}}{\text{hr}} \times 16 \frac{\text{hr}}{\text{day}} \times 8.33 \frac{\text{lb}}{\text{gal}} \times \frac{150}{1{,}000{,}000} = 168 \text{ lb/day}$$

Consider that it can be recovered in the form of a concentrated acid sulfate solution which can be returned directly to the electroplating tank. A reasonable value for this $NiSO_4 \cdot 6H_2O$ would be $0.30 a pound so the recovered product would be worth:

$$0.30 \times 168 \times \frac{262.7 \text{ (mol weight of sulfate)}}{58.69 \text{ (atomic weight of nickel)}} = \$225.60/\text{day}.$$

To find the equivalent, 168 pounds of nickel equals $\frac{168}{29.35}$ or 5.73 pounds equivalents.

Operation would be in the hydrogen cycle. Therefore, an operating cost of $7.31/lb equivalent is indicated and is equal to 5.73 x 7.31 = $41.80/day. From the table below we take a rated capacity of 3.5 pounds equivalent per 100 cu ft. Thus, the quantity of cation exchanger involved would be $\frac{5.73}{3.5} \times 100 = 164$ cu ft/day. Then from Figure 4, the equipment cost would be $20,000 for one regeneration per day. If two regenerations are conducted per day, the equipment would be an 82 cu ft unit which costs about $13,000. The net daily operating cost would be $225.60 − 41.80 = $183.80 per day in recovered nickel.* The investment cost would then

*(This could be restated: The net saving per day would be the nickel recovery of $225.60 less the operating cost, $41.80 or $183.80/day.—Ed.)

be repaid in approximately 104 operating days for once a day regeneration and in 70 days for twice a day regeneration. Obviously, this would be an attractive venture.

APPROXIMATE RATED CAPACITIES OF ION EXCHANGERS

Cation Exchange

Na Cycle—sulfonated polystyrene	7–5 lb equiv/100 cu ft
H Cycle—sulfonated polystyrene	3–5–6 lb equiv/100 cu ft

Anion Exchange

Weak base anion exchange	5–5 lb equiv/100 cu ft
Strong base anion exchange	3–5 lb equiv/100 cu ft

It must be understood that ion exchange equipment is tailor-made for each application. It is available to the metal finishing industry in accordance with individual needs. For small electroplating shops, ion exchange equipment can be reduced in size and magnitude, depending on requirements, so that a total investment of $3,000 for capital equipment might be all that is required.

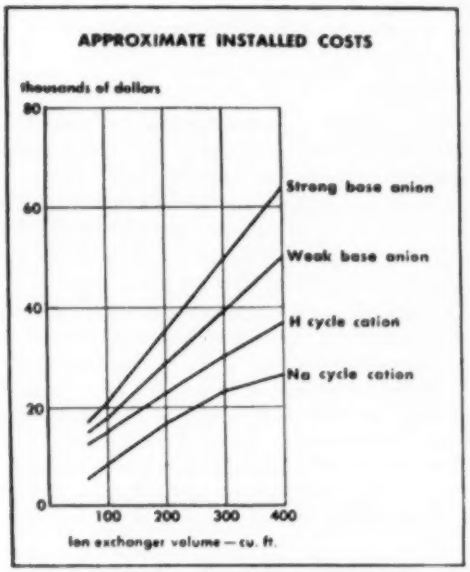


Figure 4
Ion exchange. Investment and operating cost graph

Ion exchange installations have been made in the metal finishing trade for many shops, large and small, with the range of costs for equipment and erection varying from $5,000 up to and in excess of $100,000.

The small shop need not be discouraged by the following examples which represent a considerable investment. In all instances, the size of installation is dictated by the quantity of solutions to be processed and the concentration of contaminants in the solution.

COST ANALYSIS

Chromic Acid Recovery Plant. The operating cost, chemical and personnel, and investment cost for the installation of an ion exchange treatment plant for recovery of chromic acid from rinse waters and revivification of plating baths for a mid-western chrome plating concern which installed ion exchange equipment for recovery of chromic acid worked out as follows.

This plant is presently operating three 8 hour shifts per day and operating 7 days per week. Consequently, the equipment had to be installed for continuous service in treating their rinsing solutions. Thus, an ion exchange installation of double units was furnished to insure continuous processing of solution to service.

In order to facilitate the control of their plating baths, a separate demineralizing plant was furnished for the sole purpose of producing demineralized water for makeup of solution to the primary plating baths and feeding of demineralized water to the ion exchange units on the chromic acid recovery service. This was done in order to avoid contamination of the recovered chromic acid due to contaminants in the raw water if this raw water were used to regenerate the ion exchange equipment.

The requirements of the ion exchange plant were to process

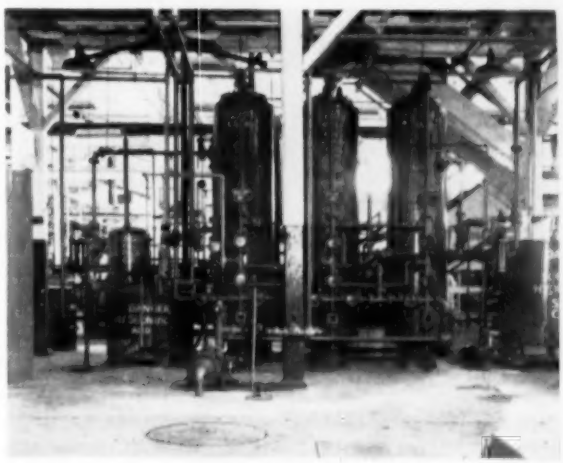


Figure 5
Chromate recovery by ion exchange including anodizing bath purification and waste water treatment in an aircraft plant in Wichita, Kansas. (Beech Aircraft)

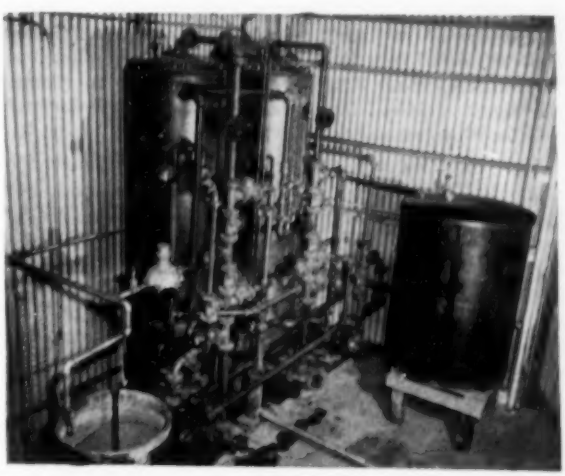


Figure 6
Chromic acid recovery equipment consisting of Permutit Q and Permutit S units for treating rinse waters and anodizing baths. (Jonco Aircraft, Shawnee, Oklahoma)

continually 35 gpm of recirculated rinse water or 50,400 gal/day and to treat 795 gallons of plating solution per week made up at 2.5 pounds of chromic acid per gallon.

The plating baths are allowed to build up to a concentration of 0.802 oz/gal of iron and 0.15 oz/gal of trivalent chromium. At this point, the plating solutions are processed through a unit* of the chromic acid recovery plant. Here, the metallic cations, iron and trivalent chromium, are removed from solution and the revivified chromic acid plating solutions returned to the plating bath.

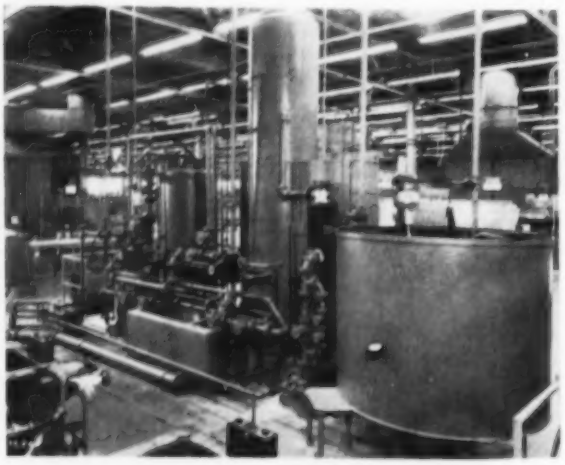


Figure 7
Chromic acid recovery equipment consisting of a Permutit Q unit and Permutit S unit for the treatment of rinse waters, anodizing baths and production of demineralized water. (Ford Motor Co., Claycomo, Missouri)

On the rinse water treatment cycle, the 2 cation exchange units and 2 anion exchange units, are rated to remove 100 pounds of chromic acid expressed as CrO_3 per week from the rinse waters. The anion exchange units† serve the purpose of removing the hexavalent chromium from the rinse waters. The cation exchange units perform the dual job of removing trace quantities of metallic cations from the rinse water and the reformation of the regenerant from the anion exchange unit to chromic acid. When the chromic acid is regenerated from the anion exchange unit, it is present in the effluent of the anion exchange unit as a sodium chromate. Consequently, it is passed through the cation exchange unit for reformation to chromic acid.

Thus, there is a plant which recovers for re-use the chromic acid normally washed off in the rinse waters; the chromic acid that would normally be dumped from the plating baths in order to maintain metallic cation concentration at a satisfactory level; furnishing demineralized water for all rinsing purposes; and makeup of plating baths. The plant serves a secondary function of eliminating the discharge of hexavalent chromium in the effluent from the plating processes to comply with local health authority requirements.

The cation exchange units when treating the exhausted plating solutions for metallic cation removal, processes 795 gallons of plating solution per week at a concentration of 2.5 lb of CrO_3 per gallon. Hence, a total of 1,988 lb of CrO_3 are revivified, or recovered, per week. This represents a large monetary return to the plant.

The anion exchange units, in connection with the cation exchange units, recover 100 lb of chromic acid expressed as CrO_3 per week from the rinse waters, again at a substantial dollar return to the plant.

Production of demineralized water for makeup to the plating baths and for use in regeneration of the ion exchange units on the chromic acid recovery service is an outright cost for regeneration chemicals and labor to regenerate the units.

Over-all economics of this installation are as follows:

	Chromic Acid Recovered (Profit)	Regenerant Chemical Consumed (Loss)	Total Labor Invested (Loss)	Balance
Treating Plating Solution	$596.40	$13.56	$21.00	(+)$561.84
Treating Rinse Waters	30.00	23.30	52.50	(−) 45.80
Demineralized Raw Water	none	5.39	22.75	(−) 28.14
	$626.40	$42.25	$96.25	(+)$487.90

The above costs of operation are based on a chromic acid cost of $0.30/lb; sulfuric acid cost of $0.017/lb; caustic soda cost of $.045/lb; and a labor cost of $1.75/hr.

From the above table, it can be seen that there is a net profit to the plant of $487.90 per week. Since the plant is operated 52 weeks per year, there is a total net profit gain for operating the plant of $25,370.80 per year.

To realize these profits it was necessary for the manufacturer to install the ion exchange equipment at an approximate installed cost of $45,000.00. If an annual fixed charge on initial installed investment of 15 per cent were assumed, the fixed charges per year applied against the plant would be $6,750.00. Consequently, the plant is operating at a net profit per year of $18,620.80. Thus, on an initial installed investment of $45,000.00 and a return of $18,620.80 per year, the initial investment will be returned in approximately 2.5 years.

One favorable factor in the initial and operating cost of this plant is that the chromic acid concentrations available in the effluent of the ion exchange equipment were such that reconcentration with an evaporator was not necessary before additions of the treated chromic acid to the plating baths were made. Some plants, under certain circumstances, would require an evaporator and thus increase the initial investment and operating costs.

Metal Finishing Plant. A plating plant was faced with a rather critical problem in that the parts to be metal finished were relatively small and intricate in nature. Furthermore, the ultimate disposition of these finished parts were assembled in a critical piece of equipment requiring a high quality finish. Due to the relatively small physical dimensions of the parts to be finished, it was difficult to buff or polish those parts that were contaminated or which suffered from a film due to precipitates from the rinse water.

Consequently, a very high quality water was specified to be used for the rinsing operation. This dictated the use of demineralized water. Distilled water was ruled out because of the volume of water required, 50 gal/min, which would necessitate a very high investment in stills.

An analysis of the raw water available in this shop for rinsing operations or makeup of their primary finishing baths is as follows:

Substance	Symbol	Parts per million (as $CaCO_3$)
CATIONS		
Calcium	Ca^{++}	112
Magnesium	Mg^{++}	70
Sodium	Na^{+}	37
Hydrogen—Acidity	H^{+}	0
Total cations		219
ANIONS		
Bicarbonate—Alkalinity	HCO_3^{-}	183
Carbonate—Alkalinity	CO_3^{--}	0
Hydroxide—Alkalinity	OH^{-}	0
Phosphate—Alkalinity	PO_4^{---}	0
Chloride	Cl^{-}	20
Sulfate	SO_4^{--}	16
Nitrate	NO_3^{-}	Trace
Total anions		219

	Symbol	Parts per million (as $CaCO_3$)
Total Hardness		182
Alkalinity A (Methyl Orange)		183
Alkalinity B (Phenolphthalein)		0
Noncarbonate Hardness		0
Sodium Alkalinity		1
Carbon dioxide	CO_2	11
Silica	SiO_2	32
Iron	Fe	0.12
Turbidity		1
Color		5
Total Solids (Cations + SiO_2)		—
*p*H		7.45

To demineralize this water with ion exchange equipment at the rate of 50 gal/min dictated the installation of rather large and cumbersome ion exchange equipment. An investigation was made into the type of metal finishing work that would be done and the amount of dragout of primary finishing solutions into the rinse waters that would occur and thus the contamination load in the rinse water effluent from the finishing shop. It was found that the raw water for makeup to the plant contained a total cation concentration of 12.8 gr/gal expressed as calcium carbonate and a total acidity concentration of 15 gr/gal expressed as calcium carbonate. The amount of dragout to the rinse water was such as to contribute only a very minor amount of chemical load in the rinsing system effluent.

Consequently, the installation of ion exchange equipment was investigated with the express idea of recirculating the rinse waters from the metal finishing plant through ion exchange equipment and returning the demineralized water to the rinsing tanks. Thus, demineralized water of high quality, would be returned to the rinse tanks and the loading on the ion exchange equipment would be only a fraction of that which would occur if raw water were to be demineralized and passed on a once-through system through the rinsing tanks.

A partial listing of the variety of finishing work being done in this plant is as follows:

Alkali electroclean
Acid dips—hydrochloric acid and sulfuric acid
Copper bright dip
Copper strike
Copper plate (cyanide copper)
Silver strike (cyanide silver)
Silver plate (cyanide silver)
Nickel strike (nickel chloride)
Nickel plate (nickel sulphate)
Nickel electropolish
Monel bright dip
Sodium cyanide—bath
Sodium nitrate—bath

Not only did the contamination, contributed from dragout, in the finishing process have to be considered, but it is necessary to consider the requirements for makeup water to the system due to evaporation and dragout losses. Consequently, with the percentage of makeup water required for evaporation and dragout losses contributing a loading upon the ion exchange equipment in addition to that due to dragout from the primary tanks, it was found that the total chemical loading would be the equivalent to 1.4 gr/gal expressed as calcium carbonate. It can be readily seen that this is considerably less than the 15 gr/gal expressed as calcium carbonate contributed by 100 per cent raw water makeup.

Therefore, the decision was made to install ion exchange equipment for processing a recirculated rinse in lieu of processing 100 per cent makeup to the rinsing system.

In addition to lessening the operating expense for producing demineralized water, the ion exchange equipment also served the function of concentrating the contamination from the metal finishing solutions in the rinse water so that they were present in the ion exchange regenerant effluent in concentrated form for post-treatment. This reduced considerably the size of batch type equipment required for detoxifying and neutralizing the plating plant effluents to comply with local health requirements.

A post-treatment plant was provided for detoxifying and neutralizing the regenerant effluent from the ion exchange equipment. However, that will not be taken into consideration in the operating economy. It is a requirement for a metal finishing plant in the geographic location of this plant whether or not they install ion exchange equipment. However, the installation of ion exchange equipment reduced considerably the size of post-treatment equipment required, as well as producing repetitive quantities and concentrations of solution requiring treatment. This simplified control of chemical additions and reduced operating personnel control required for detoxifying and neutralizing the discharge from the plating room.

A pair of cation exchange units* and a pair of anion exchange units† were installed to process continuously to service a flow rate of 50 gal/min. Thus, while one set of equipment is off the line for regeneration purposes, the other set of cation and anion units process the required flow.

The ion exchange equipment was employed to demineralize raw water for filling up all primary metal finishing tanks and the rinse water tanks. When the system was filled and in operating condition the units were then turned over to processing the recirculated rinse.

During the processing of the raw water for filling up the system, 7.04 pounds of acid and 0.44 pounds of caustic were required per 1000 gallons of water. Each cation and anion unit required regeneration once per day. Consequently, there was a complete regeneration of both cation and both anion units in a day's time.

This gives us an indication as to the investment in chemical and operating personnel cost if raw water were to be de-

mineralized, passed through the rinsing tanks and then discharged to the post-treatment plant.

Acid at 7.04 lb/1000 gal at $0.017/lb = $0.1197/1000 gal
Caustic at 6.44 lb/1000 gal at $0.045/lb = $0.2898/1000 gal
Chemical cost = $0.4095/1000 gal of demineralized water
24,000 gallons of demineralized water produced per 8 hours at $0.4095/1000 gal = $9.83/day chemical cost
Operating personnel time 8 hours at $1.75/hr = $14.00/day
Total chemical and operating personnel cost $23.83/day

When the ion exchange equipment was used for demineralizing the recirculated rinse water, the following operating chemical and operating personnel costs were realized. Due to the light load on the ion exchange equipment, one cation exchange unit and one anion exchange unit required regeneration only once per week. Thus, the labor cost rated on a daily basis was at a minimum. The following costs were realized:

Acid at 1.1 lb/1000 gal at $0.017/lb = $0.0187/1000 gal
Caustic at 0.6 lb/1000 gal at $0.045/lb = $0.0270/1000 gal
Chemical Cost = $0.0457/1000 gal
24,000 gallons of demineralized water produced per day at $0.045/1000 gal = $1.10/day
Operating labor at 4 hours per regeneration of a pair of cation and anion exchangers, once per week, is the equivalent of 4/5 of an hour per day at $1.75/hr = $1.40/day for operating labor

Consequently, the total investment for regenerating chemicals and operating labor on a daily basis for processing recirculated rinses was $2.50/day.

If we assume 250 operating days per year, the investment, if 100 per cent raw water makeup were to be demineralized, for chemicals and operating personnel, would be $23.83/day or $5,957.50/year. This is as against operating labor and operating chemical cost for demineralizing recirculated water at $2.50/day or $625.00/year.

Due to the size of this plating shop's operations, a total installed investment for ion exchange equipment of approximately $35,000.00 was required.

If we assume an annual 15 per cent fixed charge on initial installed investment, we would have a fixed charge of $5,250.00/year on investment in equipment.

Thus for demineralizing 100 per cent raw water, there would be a total cost per year of $5,957.50 for operating labor and chemicals plus $5,250.00 for fixed charges on investment or a total cost per year of $11,207.50.

The same fixed charges of $5,250.00/year apply to the demineralizing of recirculated rinse waters. Thus the cost per year for demineralizing the recirculated rinse waters would be $625.00/year for operating personnel and chemicals, $5,250.00 for fixed charges on investment for a total cost per year of $5,875.00.

Therefore, the demineralization of the recirculated rinse waters required a yearly cost of $5,332.50 less than the yearly cost of demineralizing 100 per cent raw water makeup. In 6.57 years, the savings of demineralizing the recirculated rinse waters in lieu of the raw water would pay for the investment in equipment for processing the recirculated rinse waters.

The above-cited installation is one of the few applications, to date, of ion exchange equipment for processing a miscellaneous mixture of plating room rinse waters particularly those containing cyanide from cyanide finishing baths.

If the operating labor for operating a batch destruction plant on a once-through rinse system of 50 gal/min were to be compared against the labor costs for operating the batch treatment plant on the regenerant effluents from the ion exchange equipment and entered into the above economic comparison, the payoff period of 6.57 years would be considerably reduced.

When processing the miscellaneous rinse waters through the ion exchange equipment regenerant effluents requiring treatment from the ion exchange equipment are only produced once per week. The chemical investment for detoxification and neutralization would be the same as that for the plant processing a 50 gal/min effluent in the batch treatment plant from the metal finishing plant. However, the operating personnel time invested is only approximately 1/5 of that which would be required on the 50 gal/min once-through system.

An added feature is the ease of operation in that the regenerant effluents from the ion exchange equipment are consistent in volume and concentration. Thus, they are much easier to handle than the rinse waters if they were not processed through the ion exchange equipment. The rinse waters, if not processed through the ion exchange equipment, would be consistent in volume but would vary considerably in concentration depending on the fluctuation in the variety of metal finishing operations at any one time in the plating room.

The ion exchange resins are rated for removal of a definite number of pounds of chemical and will only exhaust when they have removed this quantity. The variation in concentration of the contaminants being passed through the ion exchange equipment does not affect the ultimate regenerant effluent from the equipment.

Although the two plants cited above for application of ion exchange equipment to the metal finishing industry, one strictly for application in the chromic acid finishing field and the other for application in the miscellaneous plating field, outline plants that represent a considerable investment, this does not necessarily dictate that all ion exchange equipment installations must be of this size and magnitude.

BIBLIOGRAPHY

(1) L. Besbner and A. B. Mindler, "Ion Exchange in Waste Treatment," Ind. & Eng. Chem., 41, 448-52 (1949).
(2) F. Paulson, "Plating Waste Treatment," Metal Progress, 64, No. 2 (Aug. 1953).
(3) C. Bueltman, "Do's and Don'ts in Plating Operations," Metal Finishing (April 1955).
(4) J. B. Smith, "Demineralization—A Means to Purer Water," Industry and Power (October 1954).
(5) F. H. Burstall, P. J. Forrest, N. F. Kember and R. A. Wells, "Ion Exchange for Recovery of Gold from Cyanide Solution," Ind. and Eng. Chem. 45, 1648-58 (1953).
(6) D. Milne, "AES Proceedings," 39, 55 (1952).

ALBERT B. MINDLER

Graduate of Lehigh University, Bethlehem, Pennsylvania. Chemical Engineer and member of the Special Applications Department of The Permutit Company. Is engaged in development work on ion exchange applications for fields other than water treatment.

CHARLES BUELTMAN

Graduate of Rensselaer Polytechnic Institute, Troy, New York, in 1947 with B.S. In 1948 received his B.C.E. Member of the Permutit Sales Department since September 1948. Member of the New York Branch AES.

Practical Methods for Treatment of Metal Finishing Wastes*

J. C. HESLER†

PART I. THEORETICAL CONSIDERATIONS

As the result of the passage of antipollution laws by the Federal Government, with the formation of state compacts designed to curb or eliminate pollution of streams, rivers and lakes, and because many municipalities are restricting the types of wastes which may be discharged to their sewage treatment plants, many plating plants, large and small, are finding themselves in difficulty. Generally speaking, it is those plants located in rural or semirural locations which have been affected most, since waste discharges are most readily observed under these conditions, but even in the larger cities, water and sanitation departments are beginning to impose limitations on sewer discharges in an effort to prevent sewer-main attack, and to protect the biological digestion organisms against chemical poisoning. A slug of cyanide waste, for example, is capable of stopping all digestion processes in a sewage plant and to put that plant out of service for days until new cultures have been built up. Generally, the domestic sewage constantly being discharged to the sewage treatment plant is then by-passed for this period of time to the receiving water body which is normally intended to receive only treated sewage, causing further complications. It is evident, therefore, that even minor or accidental discharges of toxic materials may have serious aftermaths. More than one plating plant which has been running rinse wastes and alkaline and acid cleaners to the sewer for years without complaint has been required to install complete treatment facilities as the condition under which permission to increase production is granted. Practically all new plants must install waste-treating facilities coincidentally with plating equipment.

Practically the entire plating industry is therefore faced with the need to control the wastes resulting from its operations, and yet the words "Waste Treatment" frequently appear forbidding and all inclusive. Many manufacturers feel it imposes undue hardship upon them and are at a loss to start a cleanup campaign. Yet an intelligent approach to the problem often reveals methods or combinations of methods which can reduce cost and size of waste treating equipment, and—in some instances—turn costly waste treatment plans into profitable recovery procedures.

GOOD HOUSEKEEPING

In beginning a program to reduce waste discharge, a revamping of existing plating procedures is a "must". Much can be done in the way of fog rinses, retention of racked parts over drip boards or dry reclaim tanks, rotation of barrels before and after a plating bath, and limitation of water flows in rinses to the minimum volume consistent with good rinsing (even to the extent of locked flow control valves) to cut down on dragout and excessive rinse flows. These principles are familiar to all platers, but it is amazing how an intelligent study of these applications may lead to changes or curbs which will markedly reduce both concentration levels and volumes of waste from a plant.

†Water and Waste Treatment Division, Industrial Filter & Pump Mfg. Co., Chicago, Ill.

*Presented at the 42nd Annual AES Convention, Cleveland, Ohio. The discussion following the presentation is not included here but will be found in the "Annual Proceedings of the AES, 1955."

Such studies include segregation of strong or toxic wastes from relatively dilute and harmless flows, so that the latter may be discharged in large volume without restriction, and the former treated in a concentrated state in a small fraction of the previous volumes. Such changes to segregate wastes may sometimes be expensive to install in existing plants, but inevitably will reduce the initial and operating costs of the resultant waste treatment plant to the minimum.

WASTE FLOWS

After every effort has been made to reduce waste concentrations, a study of those materials which must be treated before discharge should then be made. Discharges from plating plants may be broken down into two categories; first the cleaning, acid pickling and plating solutions themselves, and secondly, the rinse waters following each of these operations:

CLEANERS

Alkaline electro-cleaners and alkaline cleaners are expendable; they must be dumped periodically and replaced. Generally they contain caustic, carbonates, phosphates, silicates and detergents or wetting agents, none of which is typically toxic, but objectionable only to the extent to which they increase the *p*H of the receiving sewer or ground supply; most cities and states limit the *p*H to a range of 7–9, with occasional emphasis on maximum dissolved solids concentrations. The problem here is one of neutralization, possibly also oil skimming and precipitated solids removal.

ACID DIPS

Acid dip solutions are normally replaced when their efficiency drops; at this time they are still excessively acid and contain dissolved heavy metal salts as well. They are objectionable primarily from the standpoints of *p*H effect, and sometimes from the metal cations they contain. The problem is one of neutralization of sulfuric, hydrochloric, nitric and phosphoric acids, together with removal of metal precipitates when required.

BRIGHT DIPS

Bright dips and other finishes include relatively dilute acid treatments and chromate treatments. These are frequently discharged and require treatment for *p*H adjustment, chromate removal, or both.

PLATING SOLUTIONS

Plating solutions are practically never dumped, with the possible exception of very badly contaminated baths. Every effort is made to treat plating solutions to recover them, and generally the only waste consideration is the sludge produced in clean-up procedures.

RELATED CONCENTRATED SOLUTIONS

Anodizing and copper stripping baths of chromic acid lose in efficiency or stripping rate as metal contamination increases; it is customary to discard a part or all of such baths and to replace them with fresh solutions from time to time. These solutions constitute a real waste problem, almost always requiring treatment before release to the sewer.

RINSE WATER WASTES

Each of the solutions above is usually followed by one or more still or running rinses. Some may require treatment, others may not. For example:

ALKALINE CLEANER RINSES

Laboratory analyses and calculations of dragout contamination from alkaline cleaner tanks have frequently proved that running rinses of this type do not require treatment. They are generally so dilute that they often impart less alkalinity than that of the water used at the plant itself. In addition they self-neutralize similar dilute acid rinses.

ACID DIP RINSES

By actual analysis it has frequently been found that the free acidity discharged in running rinses of this type seldom reaches levels requiring treatment, especially if they are discharged simultaneously with the alkaline rinses and self-neutralization occurs.

Generally speaking, dilute acid and alkali rinses may be discharged without fear of pollution, and often make it possible to eliminate large volumes of water from the consideration of treatment plants.

BRIGHT DIP RINSES

Chromate bright dips may produce rinse waters containing chromates in excess of allowable limits, which vary from locality to locality depending on the points of final discharge. Chromates may be rendered harmless either by reduction or by ion exchange techniques.

PLATING BATH RINSE WATERS

The rinses following plating baths require most attention as potential pollutants, since they comprise the bulk of waste waters discharged from the line.

CYANIDE, COPPER, ZINC, CADMIUM RINSES

Rinses from the alkaline cyanide baths, copper, zinc, and cadmium, require treatment to remove cyanides, cyanide complexes and heavy metals. The usual limitations on cyanide rinses require residual values of 1 ppm cyanide ion or less; copper of 3 ppm or less, and other heavy metals with somewhat higher tolerances.

A recognized treatment of cyanides is alkaline chlorination, using chlorine gas and alkali, or hypochlorites for destruction. Oxidation of cyanide to cyanates is sometimes permitted, since cyanate is only about one thousandth as toxic as cyanide, but complete oxidation to free nitrogen and carbon dioxide is more frequently the rule. Plants may be of the batch type, semicontinuous type, or fully continuous and automatic type. Spent alkalies from other processes, if low in organic matter content, may be used to provide the alkali originally required for the oxidation reaction, and spent acids from other processes may be used for final *p*H control and—incidentally—for their own neutralization before discharge.

Ion exchange may be practiced on these solutions to remove cyanide, but certain cyanide complexes, notably copper, are not readily treated by this method; in addition, there is some leakage of cyanides through demineralization equipment which may be detrimental if the recovered water is reused on rinse operations other than cyanide lines.

CHROME RINSES

Chrome rinse waters vary from a few ppm to several oz/gal in typical plating procedures; still or reclaim rinses vary from a few hundred ppm to 40 or 50 g/l. Whenever possible they are returned to the plating tanks, but such returns are limited by volume considerations and also by return of metal contaminants which nullify self-purification of the bath caused by dragout.

Flowing rinses from chrome lines may contain from 10–500 ppm of chromate. Flowing rinses from aluminum anodizing and copper stripping solutions contain 50–1000 ppm of chromate as well as significant amounts of copper and aluminum contaminants.

Most of these rinses will require treatment before discharge. Limits imposed usually vary from 1–5 ppm of hexavalent chromium. Reduction of the chromates by sulfite bearing substances such as sulfur dioxide, sulfites and bisulfites, or by ferrous salts, such as spent sulfuric acid pickle liquor, may be employed, followed by an alkaline treatment to precipitate the heavy metal cations and settling—if necessary—to permit a clear effluent to be discharged to the stream and sludges discarded by ponding, sludge drying beds or filtration. Ion exchange may be used to recover and/or concentrate chromium from rinses. It can be used, either by simple cation exchange treatment or by combination cation-anion exchange treatment to recover financially attractive amounts of chrome which would otherwise require destruction treatment before disposal.

HEAVY METAL RINSE WATERS

Probably the most common heavy metal rinses not included in the discussion above are nickel and acid copper baths; the commonly accepted tolerance for copper is 3 ppm, for nickel 5–6 ppm. Those rinses with metal contaminants in excess of these limits, or of lower limits set by local conditions, will require treatment. More dilute solutions can be discharged without treatment, provided they do not have other undesirable components.

The wastes described, with the possible inclusion of others depending on local conditions, are the ones to be considered in establishing waste treatment requirements. In the design of equipment to treat these materials, the following considerations must be evaluated:

DESIGN CONSIDERATIONS, WASTE TREATING PLANTS

Treatment plants must consider the necessity of handling:

1. Strong acids on an intermittent discharge basis
2. Strong alkalies on an intermittent discharge basis
3. Dilute metal cyanide rinses on a continuous basis
4. Dilute chromate rinses on a continuous basis
5. Strong chromate solutions on an infrequent discharge basis
6. Dilute copper and nickel solutions on a continuous basis

Since periodic discharges of strong wastes must be neutralized, or destroyed, provision in any waste treating plant must be made to handle them along with the continuous rinses. Every effort should be taken, however, to utilize these spent solutions in place of purchased reagents in the treatment of the more dilute, continuous rinses requiring *p*H adjustment during, or after, their destruction.

For destruction or neutralization plants, there are three commonly used systems, batch type, semicontinuous batch type, and continuous type. The choice of any system is determined by the volumes and types of waste to be treated, the local regulations governing the degree of treatment necessary and the available plant space.

BATCH TYPE TREATMENT

Batch type treatment is usually the simplest method of handling wastes. It can be readily controlled by the operators and is often required by authorities who wish to be certain all potentially toxic materials have been destroyed before the waste is discharged. It is possible to use this type of plant to schedule discharge of strong alkali or acid dumps for self-neutralization at times when continuous rinses are not being treated, and to use these wastes for *p*H adjustment in other treatments.

Batch type treatment has the disadvantage that it must be large enough to hold all of the plant discharges between treatment cycles, therefore requiring more space.

SEMICONTINUOUS BATCH TYPE TREATMENT

Semicontinuous batch type treatment is an adaptation of batch treatment where the holding basins are provided in duplicate to hold from four to six hours of discharge, alternately filling one basin while the other is being treated and settled. This system provides all of the features of batch systems, and reduces cost and space requirements.

CONTINUOUS TYPE TREATMENT

In continuous type plants, wastes are continuously treated and discharged in proportion to influent flow. Plants of this type require automatic controls, *p*H and oxidation-reduction controllers for chemical feeders to operate effectively, but space requirements are small in comparison with batch type plants, and operating labor cost is low. Initial costs are usually higher than batch treatment because of the instrumentation required. Failure of control equipment may also result in discharge of only partially treated wastes, but this possible difficulty may be overcome by the use of monitor or emergency controls.

In general, dilute alkali wastes requiring treatment are treated with dilute cyanide wastes, and dilute acid, nickel and acid copper wastes are treated in the same basins with chromates. Separate treatment of these two types is recommended for minimum cost, followed by blending of the treated mixtures for self-neutralization and final addition of either spent strong acid or alkali for final *p*H control.

ION EXCHANGE FOR RECOVERY OF WASTES

Ion exchange is a relatively new tool which is becoming more and more important as applications to plating waste problems are developed.

It should be noted that cation exchange treatment and demineralization treatment do not constitute waste disposal plants in the immediate sense of the word; they are capable of removing and concentrating impurities on the resin beds, and of discharging pure water for reuse, but they eventually require regeneration when exhausted and then discharge equivalent amounts of waste materials in concentrated form, usually in a volume of one hundredth to one thousandth of the original volume. The concentrated wastes must be neutralized in the usual manner before final discharge. However, ion exchange serves a valuable purpose in reclaiming and restoring some costly plating solutions and constituents.

CONTINUOUS DEMINERALIZATION OF DILUTE RINSE WATERS

Ion exchange equipment can be used to continuously treat dilute alkali, acid, chrome, nickel and acid copper wastes for removal of these impurities, with recovery for reuse of substantially all of the water in a pure state. In practice,

the dilute rinses are collected in a sump and are then pumped through the demineralization plant where all contaminating cations and anions are removed, and where the purified water is discharged for further use. When exhausted, the cation exchanger is regenerated with acid, and the spent regenerant contains all of the cations present in the rinse waters before treatment, with excess of regenerant acid. The spent regenerant from the anion column contains all of the anions present in the rinse waters before treatment, together with a small excess of caustic alkali. If chromate salts are present in the rinse waters, chromate will be concentrated in the anion regenerant and may be destroyed by by a process of acidification with the spent cation effluent, reduction with sodium bisulfite or equivalent salt, and finally precipitation with alkali of all of the heavy metals. The remaining sludges often amount to no more than 20 or 30 gallons from a plant capable of handling water flows of the order of 300–400 gpm.

Cyanide rinse waters may be similarly handled by demineralization equipment, but there is some leakage of cyanide through the ion exchanger, so that the finished water may contain a low concentration of cyanide. While this is not harmful to operations where only cyanide plating is being done, it may be undesirable to return such water to lines where other types of plating are being carried out.

DEMINERALIZATION OF CHROMATE BEARING WASTES

Demineralization equipment may also be used for the recovery of chromium from rinse waters following chromic acid plating baths, aluminum anodizing baths, and copper stripping baths.

The chromate is concentrated on the anion exchanger, and after exhaustion the caustic used for regeneration concentrates it as sodium chromate in a small volume of liquor. By passing the sodium chromate solution through the cation exchanger which has been freshly regenerated with acid, a pure solution of chromic acid, approximately 6–8 per cent by weight, is obtained. This purified solution may be used to replenish dragout and evaporation losses from the chromic acid bath, or it may be evaporated, using vacuum or atmospheric type evaporators, to the actual operating strength of the bath in use.

Demineralization of final decorative chrome plating rinse wastes is also being extensively practiced. These final rinses are generally hot, and most plating operators prefer to utilize this water over and over again to conserve heat. By installing a rinse water recirculation demineralization plant in the line, it is possible to continuously remove the traces of chromic acid which have been carried out on the work, as well as the extraneous salts which may be present. Final rinse water temperatures as high as 140° F when handling chrome-bearing rinses are now possible. Higher temperatures are not possible at the present time, since the anion exchange resin utilized is not sufficiently stable at a temperature above that specified.

In addition to complete demineralization of dilute rinse waters, hydrogen exchangers have been applied to the purification of chromic acid baths; for example, new cation exchange resins have been developed to permit removal of trivalent chromium, copper, nickel, iron and other metallic contaminants from chromic acid solutions at strengths up to 40–50 oz/gal providing proper control is practiced; degradation of the resin is more rapid, but the useful life is such that the cost of diluting tanks before ion exchange treatment, evaporators to reconcentrate the purified chromic acid, and attendant power, steam and labor costs greatly outweigh the cost of infrequent resin bed replacement. Still or save rinses of 3 to 8 oz/gal following chrome baths may be purified by cation exchange, evaporated and returned to the chrome plating bath, eliminating reduction and precipitation costs, and at the same time recovering valuable chemical.

Anodizing solutions may be continuously or intermittently treated through a cation exchanger at the prevalent concentrations of 100–125 g/l to remove the build up of aluminum and to maintain the efficiency of the chromic acid bath. Here again, it is possible to operate continuously without replacement of part or all of the chromic acid bath, avoiding waste discharge and permitting chemical recovery in one operation. In a similar fashion, the relatively strong chromic acid copper stripping solutions may be freed of copper by such treatment.

SUMMARY

Treatment of wastes from metal finishing operations is a rather complex matter by the very nature of the varied operations conducted, but an intelligent survey of each plant's problems and requirements often points the way to utilization of waste chemicals for self-neutralization, methods of minimizing flow volumes by intelligent diversion of harmless rinses, and application of procedures which may turn treatment problems into profitable recovery methods. A thorough investigation of any plating waste problem may discover methods which will simplify treatment and reduce operating costs.

PART II. PRACTICAL APPLICATIONS

The first portion of this paper has been devoted to a general discussion of plating waste problems and their solutions; the second portion describes these recent problems and the methods by which they have been solved.

BARREL PLATING—MIXED WASTES

A New England company was ordered to cease pollution of municipal sewers because of excessive discharges of cyanides, chromic acid, strong acids and strong alkalies; wastes were being discharged from a barrel plating line where cadmium and zinc plating, followed by olive drab and similar finishes, were being carried out.

The preliminary survey revealed that only some of the waste flows required treatment, while many others could be discharged freely without danger of pollution; Table I tabulates the data obtained from the survey; cyanides from steps 6, 8 and 11, chromic acid or chromates from steps B, B_1 and C all required treatment of the continuous rinses before discharge. In addition, acid, alkali and chromate dips shown in the table required periodic treatment when discharged. All other rinses containing concentrations of toxic substances below the minimum values required were discharged without treatment. These dilute flowing acid and alkali rinses were allowed to neutralize each other enroute to the sewer, and, in actual operation, were found to give an essentially neutral reaction.

Treatment plans were drawn up on the basis of semi-continuous treatment involving dual cyanide oxidation and chromate reduction basins, as shown in Fig. 1; each basin was capable of holding wastes from four hours of continuous

PLATING I. WASTES DISCHARGE SURVEY, BARREL PLATING LINE

No.	Description	Composition	Frequency of Discharge	Flowing Discharge gal/hr	Treatment Required
BARREL CYCLE Production Rate: Dragout: Rinse Rates:		8 Barrels/hr 1 gal/hr 2 Tank Volumes (cold); 1 Tank Volume (hot)/hr			
1	Bath Electrocln'r	Alkalis 8–12 oz/gal	Bi-monthly	—	Yes; Periodic
2	Cold Water Rinse	Alkalis 198 ppm Clnr	Continuous	450	No
3	Hydrochloric Acid Pickle	14% HCl Max 20 oz/gal	Bi-monthly	—	Yes; Periodic
4	Cold Water Rinse	300 ppm HCl	Continuous	450	No
5	Sodium Cyanide Dip	4–6 oz/gal NaCN	Monthly or Bi-monthly	—	Yes; Periodic
6	Cold Water	90 ppm NaCN	—	450	Yes; Continuous
7	Cadmium Plating Bath	Cd–2.5 oz/gal NaCN–15 oz/gal NaOH–1.7 oz/gal	Not Discharged	—	No
8	First Cold Water Rinse	Cd–37.5 ppm NaCN–225 ppm NaOH–260 ppm	—	450	Yes; Continuous
9	Second Cold Water Rinse	Cd–0.08 ppm NaCN–0.45 ppm NaOH–0.05 ppm	—	450	No
10	Zinc Plating Bath	Zn–4.5 oz/gal NaCN–12.3 oz/gal NaOH–10.5 oz/gal	Not Dumped	—	No
11	First Cold Water Rinse	Zn–67 ppm NaCN–184 ppm NaOH–158 ppm	—	450	Yes; Continuous
12	Second Cold Water Rinse	Zn–0.13 ppm NaCN–0.37 ppm NaOH–0.32 ppm	—	450	No
BASKET CYCLES Production Rate: Dragout:		16 Baskets/hr 1 gal/hr			
Olive Drab Finish					
A	O.D. Bath	13 oz $Na_2Cr_2O_7$/gal	Bi-monthly	—	Yes; Periodic
B	Cold Water Rinse	81 ppm $Na_2Cr_2O_7$	—	120	Yes; Continuous
Full Bright Finish and Iridescent Finish					
A_1	Brite Dip Bath	7 oz CrO_3/gal Trace H_2SO_4/gal	Weekly	—	Yes; Periodic
B_1	Cold Water Rinse	434 ppm CrO_3	—	120	Yes; Continuous
C_1	Brite Dip Caustic Leach	2 oz NaOH/gal 3.6 ppm CrO_3	Bi-weekly	—	Yes; Periodic
D_1	Cold Water Rinse	124 ppm NaOH 0.03 ppm CrO_3	—	120	No
C	Cold H_2O Rinse for O.D. No. B B.D. No. D_1 Iri. No. B_1	0.7 ppm $Na_2Cr_2O_7$ 1 ppm NaOH 3.6 ppm CrO_3	—	120	Yes; Continuous
D	Hot H_2O Rinse O.D. No. C B.D. No. C Iri. No. C	0.02 ppm NaOH Trace CrO_3	—	60	No

flow, cyanide basins being 7000 gallons in capacity, and charged at the rate of 1400 gph, chrome basins of 1500 gallons, charged at a rate of 360 gph. Basins were of steel—with chrome basins protected with a polyvinyl chloride sheet lining—and below ground, with combination recirculation and transfer pumps for mixing and discharge of neutralized wastes.

In operation, all cyanide wastes requiring treatment are segregated to flow to a cyanide basin by gravity, with chromic acid wastes segregated to flow to the chrome basin. When the basins are filled, waste flows are diverted to the second set of tanks and the destruction reactions begun on the first.

In this particular instance, because the averaged cyanide values were low, less than 90 ppm, 15 per cent sodium hypochlorite is introduced by means of a pump. Chlorination is continued until tests determined the presence of a permanent chlorine residual and the absence of cyanide.

Reduction of the acid chrome mixture in its basin is accomplished with sodium metabisulfite in acid medium. The average chrome content of the waste is 195 ppm, and required external acid addition to obtain a *p*H favorable to the reduction step; acid for the reaction is supplied from the waste hydrochloric pickle acid, utilizing this waste material to reduce operating costs. The calculated amount of bisulfite to reduce the chromates is added, and the mixture recirculated until all chromium is destroyed.

Cyanide oxidation requires about 1.5 hours, chromate reduction about 30–45 minutes, in this installation. When both reactions are completed, the acidic reduced chrome solution is pumped to the alkaline cyanide basin—intentionally sized to hold both—to permit self-neutralization of the residual acids and alkalis. The blend is recirculated until neutralization is complete. A small excess of alkali generally remains, but finishing treatment to obtain the proper *p*H for discharge is sometimes completed with waste acid or alkali from previous dumps of these solutions. The sludge of metal hydroxides is allowed to settle, the neutral supernatant liquor pumped to the sewer and the sludge discharged to a dump. The reactions are easily completed in the four hours required to fill the alternate basins.

Periodic treatments of cleaners, cyanide dips, pickling solution and chromate dips are scheduled for week-end main-

tenance when no plating is done. Alkali cleaner and cyanide dip are discharged to the cyanide side of the system, pickle acid and chromates to the chrome treating section. The reduction and oxidation steps are carried out separately until toxic materials are destroyed, and then self-neutralization of the two is completed. Judicious scheduling and balancing of these periodic dumps have made it unnecessary to utilize other than spent treating solutions for *p*H neutralization, so that waste treating costs are limited to the purchase of liquid sodium hypochlorite and sodium metabisulfite. In actual practice the plant requires about 7.5 pounds of chlorine per pound of cyanide, and 3.0 pounds of bisulfite per pound of chrome. Total costs, based on hypochlorite at $0.30 per pound of available chlorine, and $0.045 per pound of bisulfite, are $2.25 per pound of cyanide destroyed and $0.12 per pound of chromium reduced. The operators have learned that there is only little variation in concentrations of cyanide and chrome and have become adept at determining proper dosage.

The plant is now easily meeting the limitations imposed on toxic material discharges at a cost considerably less than that anticipated originally, principally because of a thorough survey which revealed that certain dilute wastes could be discharged without treatment and that others could be neutralized by their consumption as reagents used in the treatment.

CHROMIC ACID PLATING BATH PURIFICATION

A midwest appliance manufacturer decided his special chrome plating problem required a conventional bath low in dissolved metal contaminants for proper plating. Because the tolerances required of the plated parts could be met only when the plating bath contained a minimum of dissolved metallic impurities, a purification system was devised to permit frequent cation exchange treatment.

The plant was originally set up with a dilution tank to permit dilution of the 33 oz/gal solution to no more than 15–16 oz/gal to protect the cation resin against oxidative degradation, with an evaporator to remove excess water from the purified dilute solution and permit reconcentration to bath strength. Exhaustive tests conducted on a modified cation exchange resin with a higher cross-linked structure indicated that the practical life of the resin was sufficient to permit direct treatment of the undiluted bath at 33 oz/gal.

By omission of the concentrator and related tankage and pumps, the initial cost of the plant was reduced more than two-thirds; the equipment provided is schematically shown in Fig. II. It consists of a holding basin equipped with tap water cooling coils into which the bath is transferred whenever plating results or chemical tests indicate the need for treatment. A second purified bath is then placed in plating service and the first purified and stored until needed, or immediately reused. Dilution and loss of chromic acid by water in the exchanger is minimized by "sweetening-on and

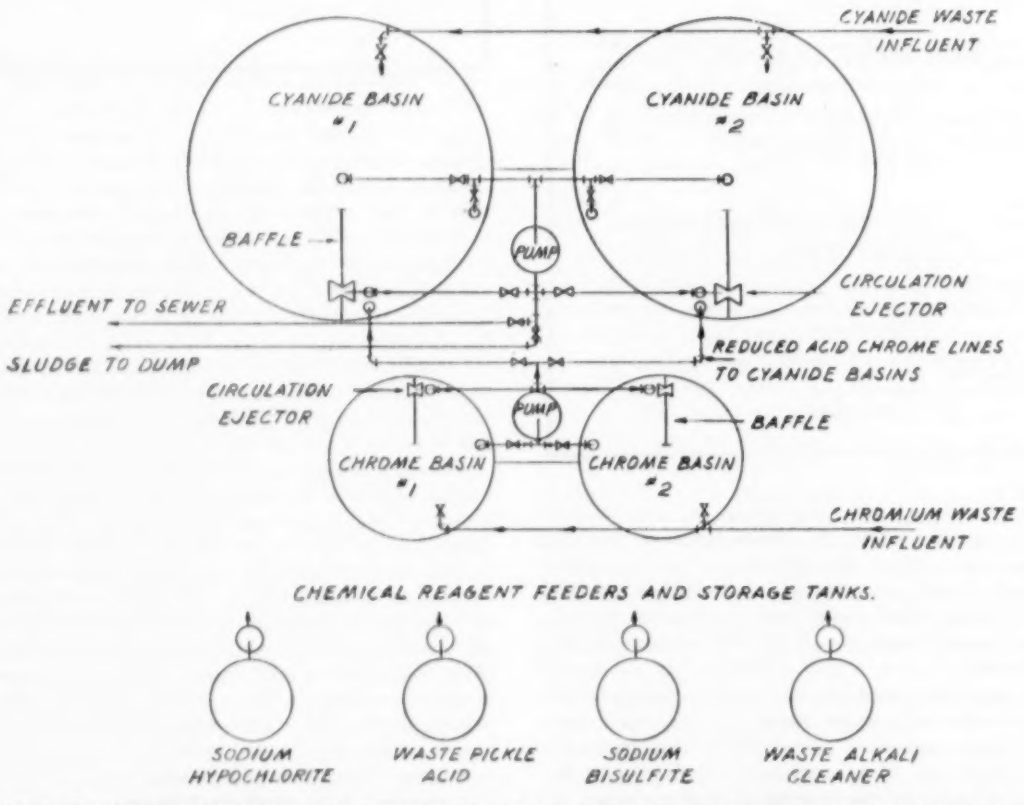


FIGURE I-CYANIDE, CHROMATE AND NEUTRALIZATION SYSTEM; SEMI-CONTINUOUS TYPE.

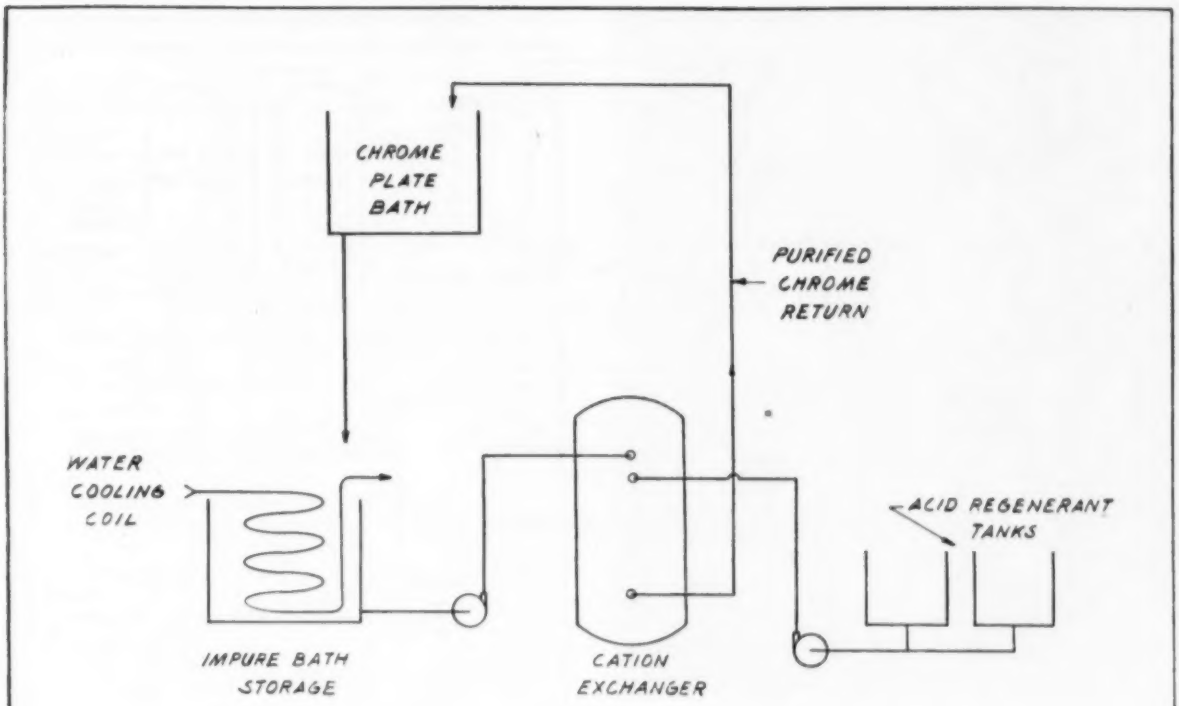


FIGURE II – CHROMIC ACID PLATING BATH PURIFICATION.

off" operations using air for complete displacement of solutions and a readily controlled purification, rinse and regeneration cycle.

The ion exchanger contains 8 cubic feet of modified resin, and is intended to treat approximately 500 gallons of plating bath per cycle. The costs of treatment are shown in Table II.

Purification is carried out approximately once per week, when contaminants approach a level of 0.2–0.4 oz/gal. Excellent results are being obtained by the purification step as evidenced by the quality of the finished work; after more than 20 cycles, no unusual changes in the physical or chemical characteristics of the resin have been observed. A close check is being kept on this unit, since it may prove that inexpensive treatment will prolong the life of other similar baths, copper stripping baths, etc., which heretofore have been processed by ion exchange only after dilution to chromic acid levels of less than 17 oz/gal.

The cation exchanger is also used at this installation for purification of the still rinse—at concentrations up to 4–5 oz/gal—so that it can be returned to the bath to make up evaporation and dragout losses.

While not a typical waste treatment problem, this application illustrates the possibilities of cation purification of other impure strong chromic acid solutions which must be dumped and treated, in whole or part, to maintain efficient plating and related operations.

TABLE II. CHROMIC ACID PLATING BATH PURIFICATION

Treatment costs based on one cycle of operation, with removal of a maximum of 200 ounces of metallic impurities (as $CaCO_3$ equivalent).

Cost of 66° H_2SO_4 regenerant at 15 lbs net consumption/cu ft (15 lbs fresh, 10 lbs reclaim), 120 lbs at $0.02/lb	$ 2.40
Ion Exchanger Depreciation, based on 10 year life, 50 cycles/yr	5.00
Resin Replacement, based on an expected life of 100 cycles	2.40
Direct labor, pumping costs, etc., 3 hours maximum	7.00
Total Cost/cycle	$ 16.80
*Value of chromic acid bath maintained at peak efficiency; 1130 lbs at $0.28/lb	$316.40

*This tabulation records only the value of the bath itself, and does not include benefits resulting from superior plated work, elimination of rejects, etc.

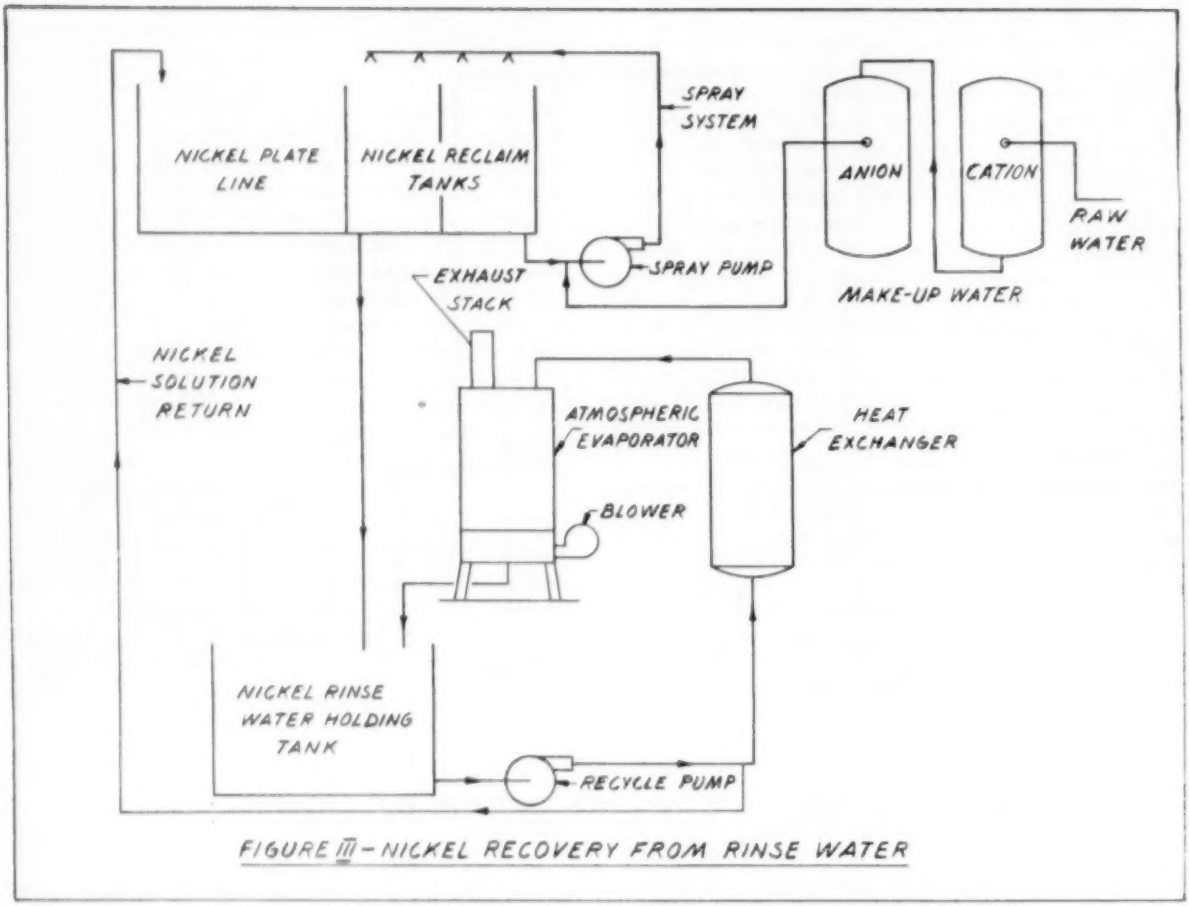


FIGURE III – NICKEL RECOVERY FROM RINSE WATER

NICKEL RECOVERY FROM PLATING OPERATIONS

An automotive parts manufacturer was concerned with loss of nickel from plating baths due to excessive dragout of solution on parts of unusual shape with many solution-holding recesses. A number of lines were in service, each with a nickel reclaim tank of approximately 500 gallon capacity. These tanks were permitted to build up nickel to high levels to permit return of as much solution to the plating bath as possible. Despite returns of still rinse solution to the plating bath, however, considerable amounts of nickel were being wasted, either by direct loss or by dragout from the reclaim rinse to the flowing rinses. If the reclaim rinses were allowed to build up to higher nickel levels, the subsequent flowing rinses required excessive water rates for satisfactory rinsing.

A nickel recovery system was installed after a study of the problem; this consisted of minor changes in the plating lines, with conversion of the still rinse, or reclaim, tanks to very slow running rinses with overspray. The rinse flow was provided by a small deionizer which delivers purified water to the second rinse tanks at a rate of approximately 8 gal/hr, with overflow being discharged to the still rinse as an overspray.

The overflows from the first rinse tank are discharged to a rinse holding tank at the 8 gph rate and continuously fed to an evaporator for reconcentration. Concentrated nickel solution at a strength of 40 oz/gal is discharged to the nickel bath for use. The equipment required is shown schematically in Fig. 3 (for one of the five plating lines).

In operation, the former reclaim rinse tanks are allowed to build up to approximately 10 oz/gal, but after an equilibrium has been reached, deionized water is turned into the system at the rate previously specified.

Although some nickel is lost in the subsequent running rinses by dragout, the system is estimated to be recovering about 90 per cent of nickel formerly dragged out of the baths. Contamination of the bath by water-borne dissolved solids is eliminated by the use of deionized water.

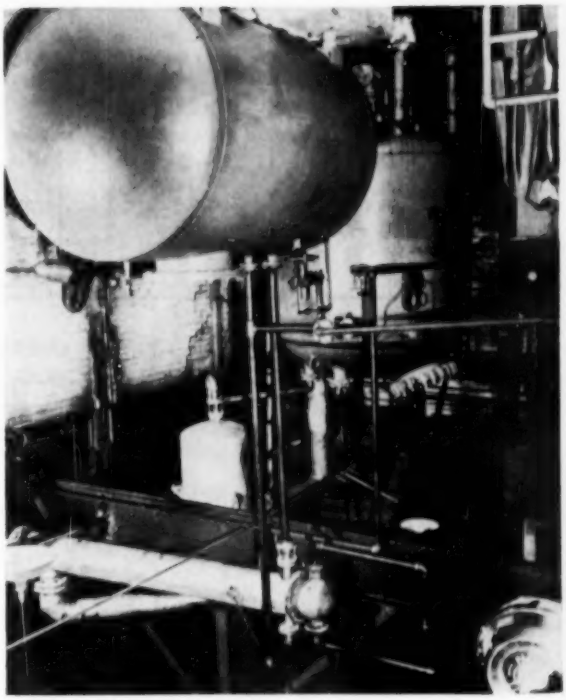
Because of the wetting agents employed in this bath, an atmospheric concentrator was utilized; it removes water by passing the rinse solution—heated to a maximum temperature of 175° F—over a bed of berl saddles countercurrent to a flow of air which removes moisture and concentrates the solution as it continuously recycles through the evaporator. Foaming due to wetting agents is not a problem in an evaporator of this type, and the operating temperature has no effect on the brighteners used.

The recovery cost of the system is tabulated on Table III, illustrating the remarkable recovery realized by the treatment.

TABLE III. NICKEL RECOVERY SYSTEM

Treatment costs based on recovery of 40 oz/gal nickel sulfate solution from 10 oz/gal reclaim rinse.

Expense:	
(Based on one week's operation—5 days 24 hours/day)	
Water:	
5,000 gallons at $0.08/1000 gallons	$ 0.40
Demineralization costs (based on 9.0 gpg solids, water, sulfuric acid at $0.015, caustic at $0.05)	0.67
Steam:	
42,375 lbs (50 psig) at $0.70/1000 lbs	29.68
Electric:	
197.0 KWH at $0.015/KWH	2.96
Depreciation:	
Concentrator, based on 10 year life	17.00
Demineralizer, based on 10 year life	4.00
Labor:	
(Including regeneration time and maintenance) 3 hours at $2.25/hr	6.75
Total Weekly Costs	$ 61.46
Credits:	
2,800 lbs Nickel salts recovered at 40 oz/gal solution.	
Recovery cost/lb	$ 0.02
(Current cost of nickel salt/lb)	0.30



Chromic Acid Concentrator, vacuum type

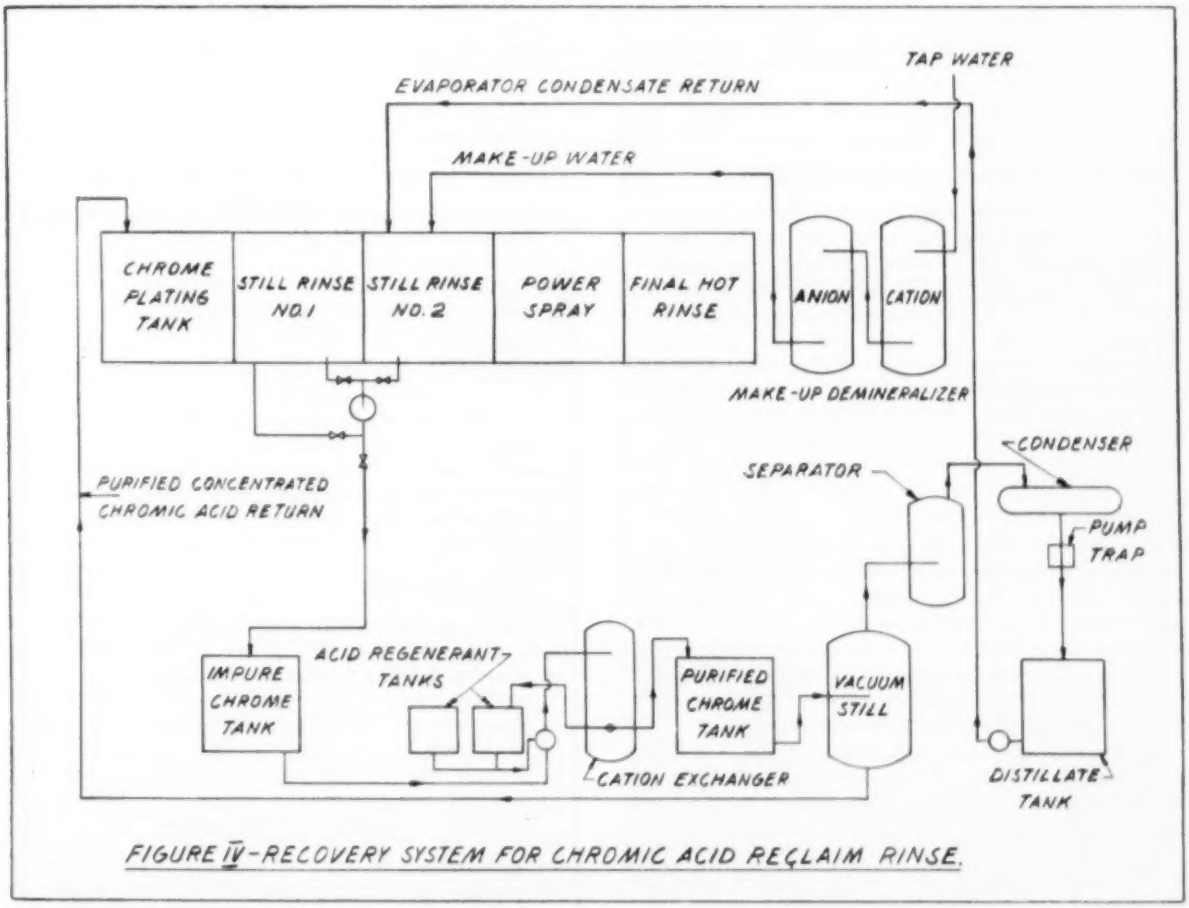


FIGURE IV-RECOVERY SYSTEM FOR CHROMIC ACID REGLAIM RINSE.

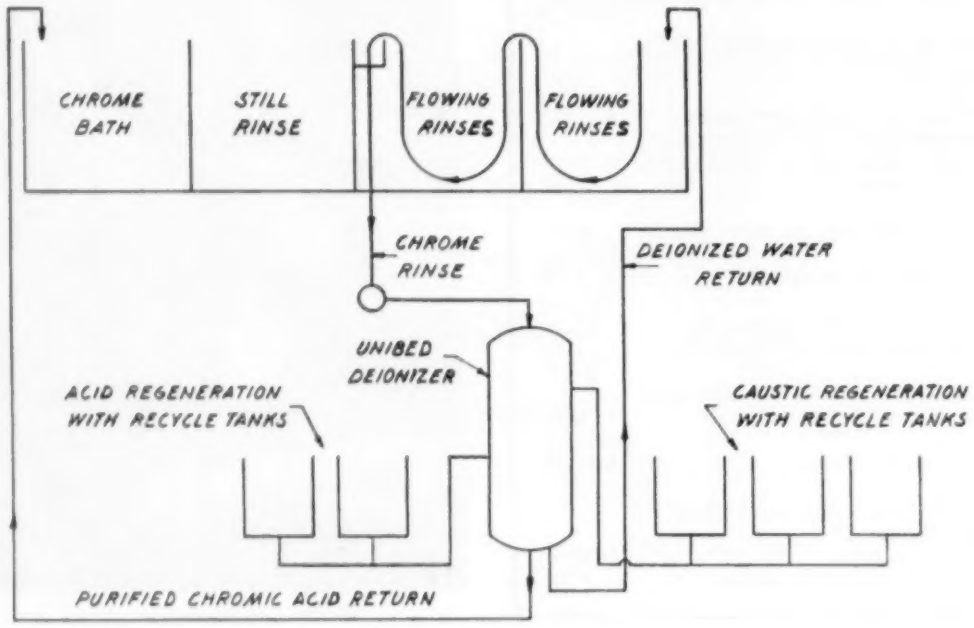


FIGURE V - CHROMIC ACID RINSE WATER RECIRCULATION SYSTEM.

CHROMIC ACID RECLAIM RINSE RECOVERY

A California manufacturer with a problem of recovering chromic acid from a plating line with two reclaim rinses, requested a system for removing metallic contaminants—principally iron, nickel and trivalent chromium—and for reconcentration of the purified solution to plating bath strength.

The plating bath operated at a strength of about 53 oz/gal; as illustrated in Fig. 4, the chromic acid concentration in still rinse No. 1 was allowed to build up to a strength of about 7.0 oz/gal, after which it was utilized to make-up evaporation losses and dragout from the plating bath itself. Still rinse No. 2 was then pumped to No. 1 position and fresh water added to the No. 2 tank.

The method in use, while conserving much of the chromic acid, had the disadvantage of permitting build up of mineral salts from the water supply in the bath, and also caused return of the metallic impurities dragged over with the chromic acid, thus nullifying the self-purification action by dragout. Evaporation and solution losses did not permit complete return of still rinse, necessitating chemical reduction and neutralization of the excess solution.

Figure 4 illustrates the solution adopted; the still rinses are operated in the previous fashion, requiring discharge to the holding basin at a strength of 7 oz/gal of CrO_3 every 48 hours of full production. The impure strong rinse, about 1,000 gallons in volume, is then freed of about 9.0 to 10.0 lbs of metallic impurities (converted to calcium carbonate equivalence) by cation exchange treatment using an acid

TABLE IV. RECOVERY OF CHROMIC ACID FROM RECLAIM RINSE

Treatment costs based on one purification cycle.	
Cation Regenerant:	
Cost of 66° H_2SO_4 regenerant at 1.5 lbs net consumption per cubic foot, and 3 cu ft resin exhausted/cycle, 4.5 lbs at $0.02/lb	$ 0.90
Cooling Water For Evaporator:	
51,000 gallons required, but not charged for since it is reused in plant operations	....
Demineralized Water Consumption:	
(For make-up to reclaim tanks, regeneration and sweetening-off operations) 500 gallons (max) at total cost of $0.20/1000 gal.	0.10
Labor:	
5 hours at $2.00/hr	10.00
Steam:	
12,300 lbs (60 psig) at $0.75/1000 lbs	9.23
Depreciation:	
Vacuum evaporator, based on 10 year life and 150 cycles/yr.	10.20
Ion exchanger, exclusive of resin, based on 10 year life and 150 cycles/yr	2.17
Cation resin, based on 150 useful cycles	1.80
Total Cost, per cycle	$ 34.40
Chrome recovered as 53 oz/gal solution, lbs.	4.30
Recovery cost/lb	$ 0.08
Current cost chromic acid/lb.	0.28

regenerated, sulfonated-polystyrene resin resistant to oxidation. The resin bed is "sweetened-off" with demineralized water from a deionization plant which also makes up losses of water from the still tanks. The total volume of purified chrome is approximately 1,050–1,075 gallons before reconcentration.

The cation exchanger requires regeneration after three purification cycles, or once each six-day week. Vacuum evaporation reduces the dilute chromic acid in approximately 130 gallons of solution at 53 oz/gal, permitting return to the plating bath directly. Photograph I illustrates the vacuum kettle, separator, condenser and condensate tank utilized. Cooling water used to cool the condenser on a once through basis is diverted to other running rinses of the plating lines and is not charged to the operation of the system. Condensate of distilled water quality is returned to the still rinse tank as shown, with necessary make-up from the deionization plant.

Although the system has not been in service for a sufficient period to verify the expected life of the resin, the plant has been performing as expected and is permitting profitable recovery of chromium.

RINSE WATER RECOVERY

An Illinois plant engaged in decorative chrome plating of appliances had a dual problem: The work coming from the final rinses following the plating carried much rinse water into the dryers, depositing a salt coating when evaporation of the high solids water occurred. The resultant water staining required a large buffing department for corrective buffing, at high cost. Rejects caused by buffing scratches were frequent, necessitating rework of the defective pieces. The shape of the parts causing water dragout was also responsible for excessive chrome dragout, so that the running rinses discharged to the sewer had an average chromic acid content of 480 ppm. The municipality in which the plant was located demanded corrective measures, limiting the total waste effluent from the plant to a maximum chromium value of 1.0 ppm.

The treatment plant shown in Fig. V was developed to meet the problem: the four flowing rinses were arranged to operate in a countercurrent fashion. A mixed-bed deionizer, together with a pump and related piping, were provided to make a closed rinse system, removing the chromic acid from the first rinse over-flow and returning purified water to the last rinse tank.

Chromic acid and the usual metallic contaminants were concentrated on the Unibed exchanger, which is an intimate mixture of cation resin and strongly basic anion resin, both stable to chromic acid at the level applied. When exhausted, the column was backwashed, separating the materials with anion resin above and cation below. Regeneration of the anion portion resulted in formation of sodium chromate, which—when again passed through the cation column—was converted to purified chromic acid suitable for return to the bath as make-up for dragout losses.

By judicious recycling of the caustic soda in several portions, the chromic acid was obtained at a strength of 6–8 per cent, strong enough for direct return to the plating bath.

Although improvement in the appearance of the plated ware was expected, the results of rinsing with deionized water exceeded all expectations; the pieces dried spot free, eliminating almost all buffing operations. Buffing scratches were eliminated, making rework of rejected parts unnecessary.

Intangible benefits from adoption of this system, and in addition to those shown in Table V, are many: the finished work coming from the dryers is brighter and meets the high standards of the manufacturer. Handling costs have been reduced with elimination of buffing operations. The limitation on chrome pollution is being easily met, and significant amounts of chrome, formerly the cause of pollution, are being recovered.

One single plant has solved not only the pollution difficulties, but has also improved the quality of the finished work.

TABLE V. RINSE WATER RECOVERY

Based on cycle of operation (24 hours) with recovery approximately 65 lbs. CrO_3.

Expense:	
Cost of 66° H_2SO_4 regenerant at 15 lbs net consumption/cu ft, 300 lbs at $0.015	$ 4 50
Cost of caustic soda regenerant, at net consumption (using recycle of caustic) of 50 lbs at $0.05	2 50
Direct labor, 6 hours at $2.25	13 50
Raw water consumption, regeneration and make-up, 4000 gallons at $0.09/thousand	36
Depreciation:	
Ion exchanger, exclusive of resin, based on 10 year life and 300 cycles/yr	$ 3 55
Cation resin, based on a minimum of 300 cycles	2 00
Anion resin, based on a minimum of 300 cycles	5 36
Total Cost/day	$ 31 77
Credit:	
Value of CrO_3 recovered as 6–8 per cent solution, 65 lbs at $0.28	$ 18 20
Value of demineralized water recovered, 17,000 gallons at $0.27/1000	4 59
Buffing labor eliminated, 32 hours at $2.25	72 00
Buffing materials eliminated, estimated	5 00
Elimination chemicals required to reduce and precipitate 65 lbs CrO_3	12 00
Total Savings/day	$111 79
Net Savings/day	$ 80 02

J. C. HESLER

Hesler

J. C. Hesler received his B. S. degree in chemistry from the University of Chicago in 1937, and a M. S. in organic chemistry in 1938. He has been engaged in water and waste treatment work since 1938, and at the present time is manager of the water and waste treatment division of Industrial Filter & Pump Manufacturing Company, Chicago, Illinois, directing its program of research in plating wastes and related problems.

SOLIDS-LIQUID SEPARATION IN THE TREATMENT OF METAL FINISHING WASTES

R. F. LEDFORD*

INTRODUCTION

Industrial expansion and population growth has focused attention on the problem of pollution to our streams and other natural resources. Water shortages throughout the country have restricted the production of certain products requiring water in the process. The increased demand for useable water is resulting in studies to continuously treat the supplies, to remove contaminants, and where possible reuse the water.

Early attempts to treat metal finishing wastes invariably referred to the use of lagoons. A lagoon is essentially a waste dump where toxic and nontoxic wastes with or without solids are deposited. Liquid bearing solids eventually dry out by evaporation or by absorption of the soil. This practice is still followed in remote areas where space is not a problem.

Since the depression years, industries have migrated from the less desirable areas of the community to urban areas. Such plants newly constructed are attractive in appearance and generally surrounded by well kept grounds. The proximity of desirable residential sections to industries has made it mandatory that such industries do not create a nuisance by polluting the air or the water. In such areas, the appearance of a lagoon would not be tolerated. In addition, such property is invariably expensive and can be more profitably utilized. It is therefore necessary to treat wastes in a manner that will not be objectionable to the neighborhood; however, such treatment must be practical and efficient.

In the treatment of most wastes commonly encountered in the chemical finishing of metals, sludge is produced. This paper will describe methods of dewatering sludge either for reuse of the water or for simple disposal of the solids by means other than lagooning.

*Industrial Filter & Pump Mfg. Co.

TYPES OF WASTES

Most plating departments contain both acid and alkaline solutions of varying descriptions. In addition to acids commonly used for pickling or etching of the basis metals, other acids are used for special applications. Such acids would be sulfuric, muriatic, phosphoric, nitric, acidic, hydrofluoric and others. In addition, some of the complex metal salts of the acid group would be zinc, nickel, cobalt, iron, chromium, lead, tin and copper. Of the alkaline group there are the various alkalies for cleaning metals prior to plating as well as cyanides, both potassium and sodium. The common complex metal salts of this group are zinc, copper, cadmium, and silver. In either the neutralization of acid solutions or the destruction of the toxic elements of this group as well as the destruction of cyanides, sludge is formed in the reaction. Such solids must be separated from the liquid if the process water is to be reused. In addition many localities restrict the disposal of liquids containing solids into sewers or streams. The separation of solids from liquid can be accomplished in several ways, and only a careful analysis of all factors will result in selecting the most suitable method.

ANALYZING THE PROBLEM

Prior experience is invaluable; however, because of the multiplicity of variables and the variety of solids-liquid separators, each problem must be carefully analyzed. A type of equipment ideally suited for one application, such as the handling of a neutralized pickle liquor, might not be applicable for a similar requirement in another plant. The factors that should be carefully considered and evaluated for each requirement are:

1. A full description of the type of waste.
2. What is the daily volume of waste?
3. Is the waste to be handled continuously or on a batch basis? If on a continuous basis, what is the maximum hourly feed? If on a batch basis, what is the maximum volume to be processed at one time?
4. What percentage of the feed is solids to be removed?
5. How will solids be disposed of?
6. Will the liquid be reused or discharged to a sewer or stream?
7. What is the allowable limits of toxicity of the sludge and liquid?
8. Will further treatment of the solids or liquid be necessary following the separation?
9. Is there a limitation on space that would restrict the selection of equipment?

After carefully answering these questions, you are still not ready to select the type of equipment without a complete chemical and physical analysis of the material prior to separation. Such studies will include:

1. A complete chemical analysis following treatment of the waste prior to separation of the liquid and solids.
2. A determination of the quantity and characteristics of the solids to be removed.
3. Can solids be readily separated from the liquid or will it be necessary to condition the solids?
4. What percentage of solubles is permissible in the solids?
5. A laboratory analysis of the settling, flocculating, or filtering characteristics of the wastes.
6. What materials of construction are suitable?
7. Is it possible to change the treatment process to eliminate wherever possible variables in the quantity, concentration and condition of the wastes which would effect solids-liquid separation.

TYPES OF SOLIDS-LIQUID SEPARATORS

Depending on the requirement, separators can range from the simple course screen type for the retention of large particles, to filtration of a type that will remove particles less than one micron size; from gravity separation to the separation by centrifugal force. There are numerous designs of equipment in all categories; however, since this article deals specifically with chemical finishing wastes only such equipment that appears applicable will be discussed.

GRAVITY SEPARATION

Clarification by gravity separation is invariably restricted to very large requirements where absolute separation of solids from liquids is not necessary. Such requirements are numerous and meet the specifications of many local ordnances and where such equipment is indicated because of volume, improved separation can be obtained by subsequent treatment.

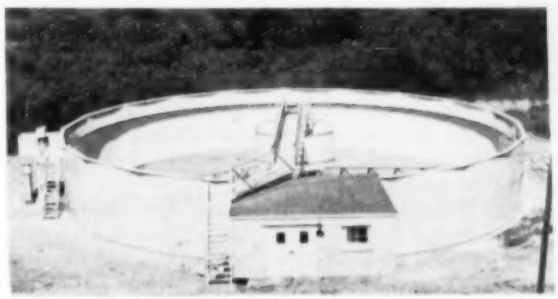


Fig. 1 *Dorr-Oliver Inc.*

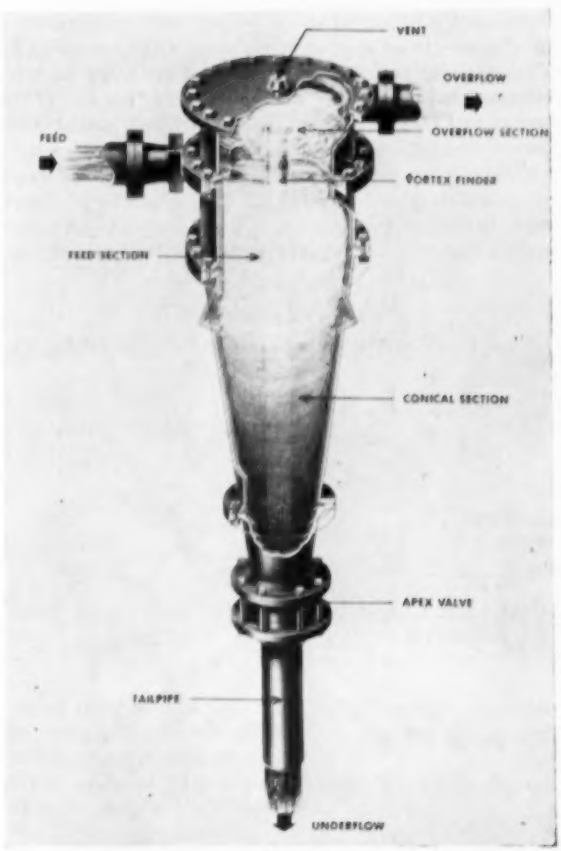


Fig. 2 *Dorr-Oliver Inc.*

In such applications, the mixed waste is conditioned to improve flocculation thus increasing the rate of settling.

Suitable flocculating agents are fed continuously to the incoming wastes where it is agitated by revolving paddles which cause the flocs to "pick up" the colloidal and semi-colloidal solids. The supernatent liquid flows out the top of the clarifier while the settled solids are pumped to a point where they can be disposed of by trucking to a dump or lagooning. Such equipment might (Fig. 1) range in size from 10 feet to 300 feet in diameter with depths of 25 feet or more and are especially adaptable for continuous flow.

CENTRIFUGALS

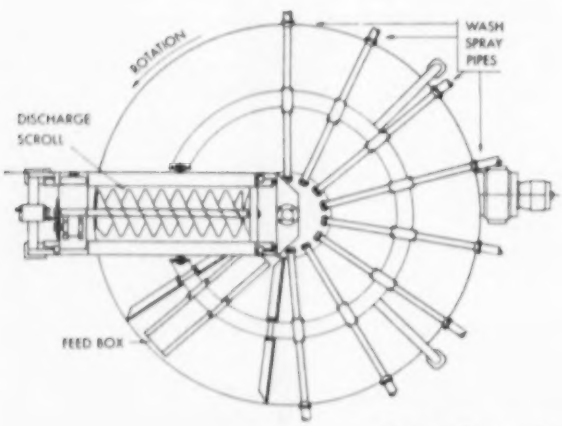
There are two general types of centrifugals; namely, (a) where the solids are retained by a porous medium while the liquid is forced through and (b) where the difference in specific gravity of solids and liquids are exaggerated by centrifugal force permitting the solids to settle and the clarified liquid to overflow. Of the two systems the first type retains solids of smaller particle size without the necessity of conditioning the wastes whereas the second type invariably requires conditioning to improve sedimentation. The high initial cost of the equipment related to relatively low capacity is undoubtedly responsible for the absence of centrifugals in metal finishing waste systems.

The wet cyclone system, while somewhat different than most equipment in this category, nevertheless depends upon centrifugal force for separation. In the wet cyclone system the waste is pumped at high velocity through an opening tangential to the cylinder wall. This results in a high centrifugal force within the cyclone, causing the solids to be thrown to the outside of the shell where they are carried in a spiral course to an opening at the apex of the cone (Fig. 2). The remaining particles and the bulk of the liquid move inward and follow a reverse spiral course near the axis of the cyclone and are discharged at the top. Where it is applicable, such equipment offers the advantage of high capacity with a minimum space requirement. Particle size of the solids removed are reported to be within a range satisfactory for some waste treatment requirements; however, there is no reference in the literature to the use of wet cyclones in such applications.

FILTERS

Solids-liquid separation in the treatment of metal finishing wastes can be met satisfactorily by filtration. The magnitude of the problem, which necessarily varies with the size of the plant, is not a serious consideration because of the various types and size of filtration equipment. The obligation of the waste treatment engineer is to select the right type of filter for each specific requirement.

There are two basic types of equipment in current use; namely, vacuum filtration and pressure filtration. In either category, several types of equipment are used, designed and constructed for either continuous or batch type operation.



Filtration Engineers, Inc.

Fig. 3

VACUUM FILTERS

Vacuum filters are offered in the rotary drum type, the flat bed type (with or without tilting pans), the endless belt type and the disc type. In each design, the filter is divided into sections or compartments which permit continuous operation because of the ability to continuously clean the filter. In operation, a section is continuously under vacuum at which stage filtering is accomplished. Solids are held on the filter membrane by vacuum permitting the liquid to flow through and discharge. With the moving filter media passing beyond the vacuum section, the cake is either washed and/or dried then discharged automatically onto an endless belt or in a tote box for disposal by trucking.

FLAT BED TYPE VACUUM FILTERS

The rotary flat bed vacuum type filter consists of a rotating table divided into segments as shown in Fig. 3. Each section is connected to a valve mechanism with controls for dewatering and other operations and discharges the cake either by a rotating scroll or by inverting or tipping the segment at the point of discharge. Liquids to be filtered are introduced at a fixed point to a segment under vacuum where dewatering takes place. The filtrate is discharged to a vacuum receiver from where it is pumped either to waste or to a point for reprocessing and reuse. As the table rotates past the filter section, washing of the cake is accomplished while still under vacuum. Drying can be accelerated in other sections of the table by air blowers, and the dewatered cake is removed at a fixed point. The cycle is then repeated as the table rotates.

DRUM TYPE VACUUM FILTERS

One of the most popular of the continuous rotary type vacuum filters is the string discharge type shown in Fig. 4. The revolving drum picks up solids on the vacuum section which is covered by a filter cloth and endless strings spaced about one-half inch apart. The cake is built up over the strings so that as they leave the drum following the vacuum section; the cake is lifted away from the cloth and carried over a discharge roll. At this point, the cake is freed from the string where it is discharged onto an endless belt or tote truck for disposal by trucking. With the rotary drum vacuum filters, additional dewatering can be accomplished by compressing the cake with either rolls or blankets.

Either the rotary drum, flat bed or endless belt type can be constructed of materials suitable for the dewatering of electroplating sludge.

The disc type rotary vacuum filter (Fig. 5) employs the same principle as the other two systems; however, in this system the solids are removed from the filter media by means of a scrapper.

Where vacuum filtration is indicated, the waste liquor should be conditioned to improve filterability and to improve dewatering of the solids. Conditioning is the result of several factors; namely, temperature, aging time, and the addition of

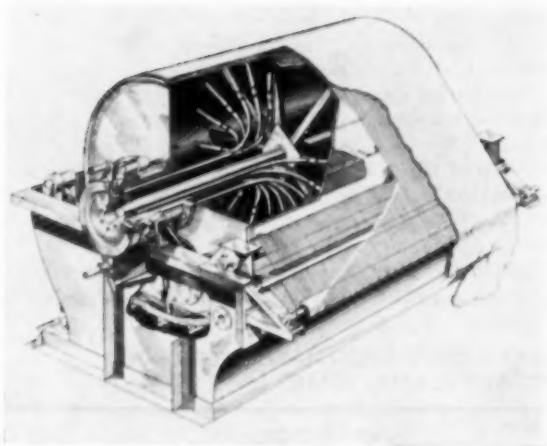


Fig. 4 *Filtration Engineers, Inc.*

flocculating or oxidizing materials. Because of the variety of wastes the conditioning treatment must necessarily vary to fit each requirement.

Neutralization of waste pickle liquors and other acid wastes is accomplished with lime or other alkalies. The type of neutralizing agent will materially affect the handling characteristics of the solids. In one study of a waste pickle liquor hydrated dolmatic, lime was superior to hydrated high calcium lime for producing sludges that would settle rapidly. *p*H adjustment of the neutralized liquor likewise affects the settling of the sludge. With mixed wastes, the performance values differ greatly from those of individual wastes. A laboratory study of four types of wastes is shown in Table I.

TABLE I.
TYPES AND COMPOSITION OF TYPICAL DILUTE ACID PLATING WASTE

A. *Simple pickling waste.*

Ion	Low Concentration (ppm)	High Concentration (ppm)
SO_4 (or Cl^-)	250	3500
Fe total	100	1500
*p*H	5	3

B. *Synthetic plating waste containing iron.*

Ion	Low Concentration (ppm)	High Concentration (ppm)
SO_4	500	2500
Cl	50	250
Cr_3	30	300
Ni	20	200
Fe total	100	1000
Zn	10	100
Cd	10	100
Cu	20	200
*p*H	2 4	1 9

C. Synthetic plating waste initially containing no Fe or Al ions. Compositions similar to B.

D. Study of specific effect of other ions on wastes similar to A and B.

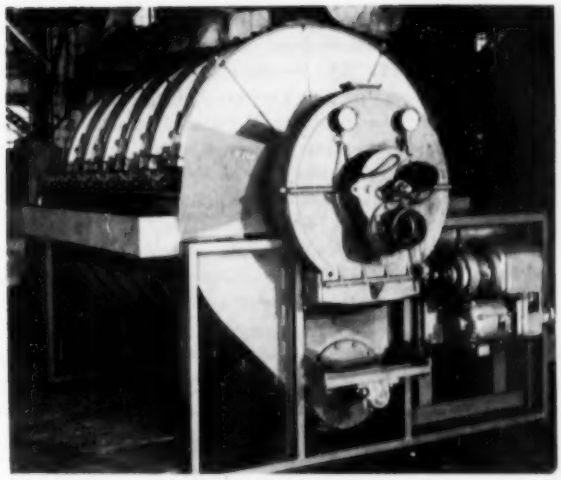
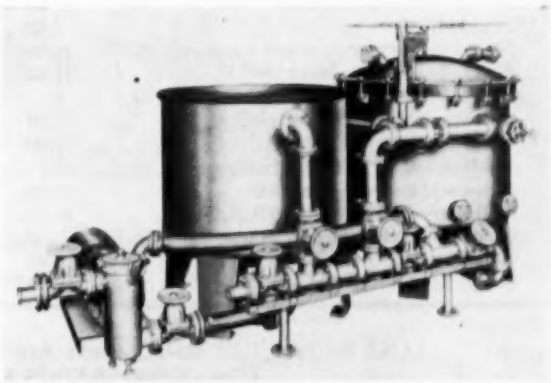


Fig. 5 *The Eimco Corp.*



Industrial Filter & Pump Mfg. Co.

Fig. 6

Aging and heat conditioning of the sludge are two variables that have a significant influence on the filterability and handleability of some wastes.

Table II shows some laboratory tests with a high concentration synthetic acid plating waste.

Table III is a similar study of a low concentration synthetic acid plating waste.

The effect of Fe^{+++} concentration upon the sludge characteristics in concentrations from zero to one thousand ppm is shown in Table IV. The results of this table indicate that when no Fe^{+++} was present very good sludge characteristics were obtained; however, with the introduction of a small quantity of Fe^{+++} a sharp drop was noted in the process index. With increasing additions of Fe^{+++} up to 1000 ppm, a further decline was noted. Quite different results were obtained, however, from Fe^{+++} additions to conditioned sludge. These additions markedly improved the process index, handleability, and cake thickness. The conclusion to be drawn here is that in wastes which contain no Fe^{+++} conditioning of the sludge is not advisable where as with wastes containing Fe^{+++} in the vicinity of 1000 ppm conditioning is definitely advisable.

A method of conditioning sulfuric acid pickle liquor prior to filtration was described at the Ninth Industrial Waste Conference at Purdue University by Lorenz W. Heise and Milton Johnson of the A. O. Smith Corporation. The problem of slime resulting from ferrous hydrate in a neutralized sulfuric acid pickle was overcome by the oxidation of a portion of the ferrous hydrate to the ferric stage.

In this operation, the pickle liquor is neutralized with lime or other alkali in the conventional fashion, and the resulting

TABLE II. EFFECT OF TEMPERATURE AND/OR AGING UPON SLUDGE CHARACTERISTICS OF HIGH CONCENTRATION SYNTHETIC ACID PLATING WASTE

Conditions Deviating from Standard*	Filter Cake Thickness (in)	Sludge Characteristics			
		Handleability	Filterability	Moisture Factor	Process Index
Standard	8/64	2	1 1	1 0	0 9
Sludge aged 18 hours at room temperature	15/64	1	0 6	1 1	1 5
Sludge heated 2 hours at 180° F	11/64	1	0 6	0 9	1 8
Sludge heated 2 hours at 180° F. Aged 18 hours at room temperature	17/64	1	0 6	0 5	3 3
Neutralized at 180° F	10/64	1	0 8	0 9	1 4
Neutralized at 180° F. Sludge aged 18 hours at room temperature	11/64	1	1 0	0 7	1 4
Sludge aged 18 hours at 160° F	26/64	1	0 3	0 7	4 8
Neutralized at 180° F. Sludge aged 18 hours at 160° F	16/64	1	0 8	0 6	2 1
Sludge aged 6 hours at 160° F	16/64	1	0 5	1 5	1 3

TABLE III. EFFECT OF TEMPERATURE AND/OR AGING UPON SLUDGE CHARACTERISTICS OF LOW CONCENTRATION SYNTHETIC ACID PLATING WASTE

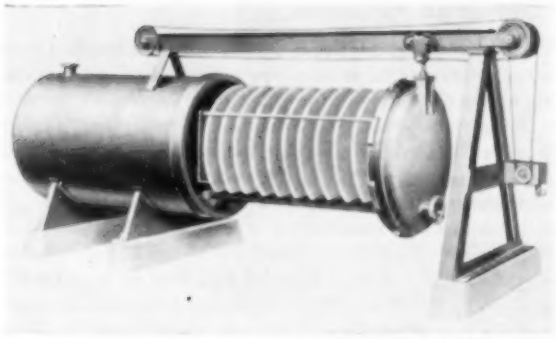
Condition Deviating from Standard	Filter Cake Thickness (in)	Sludge Characteristics			
		Handleability	Filterability	Moisture Factor	Process Index
Sludge aged 18 hours at room temperature	5/64*	1+	1 8	1 1	0 5
Sludge heated 2 hours at 180° F. Aged 18 hours at room temperature	8/64†	1	0 6	1 0	1 7
Neutralized at 180° F. Sludge aged 18 hours at 180° F	13/64‡	1	0 5	1 3	1 5

Described in Report No. 1

*150 sec filtration time. † 90 sec filtration time. ‡ 75 sec filtration time.

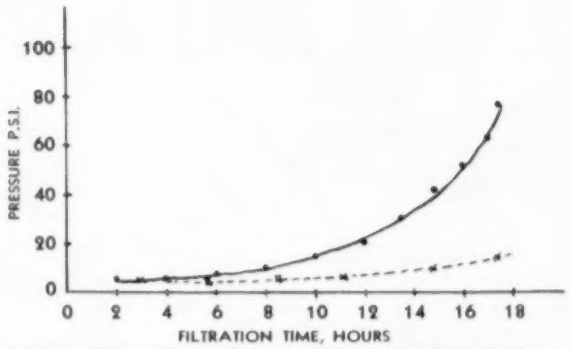
TABLE IV. EFFECT OF Fe^{+++} CONCENTRATION UPON SLUDGE CHARACTERISTICS OF HIGH CONCENTRATION SYNTHETIC ACID PLATING WASTE

Conditions Deviating from Standard		Filter Cake Thickness (in)	Sludge Characteristics			
Temperature and Aging	Fe^{+++} Concentration (ppm)		Handle-ability	Filter-ability	Moisture Factor	Process Index
—	Zero	16/64	1	0 4	0 5	5 0
—	200	11/64	1	0 6	0 9	1 9
—	400	8/64	2	0 9	0 9	1 2
—	800	8/64	2	0 9	0 8	1 4
—	1000	8/64	2	1 1	1 0	0 9
Sludge aged 18 hours at 160° F	Zero	16/64	1	0 7	0 8	1 8
Sludge aged 18 hours at 160° F	400	19/64	1	0 4	0 9	2 8
Sludge aged 18 hours at 160° F	1000	26/64	1	0 3	0 7	4 8



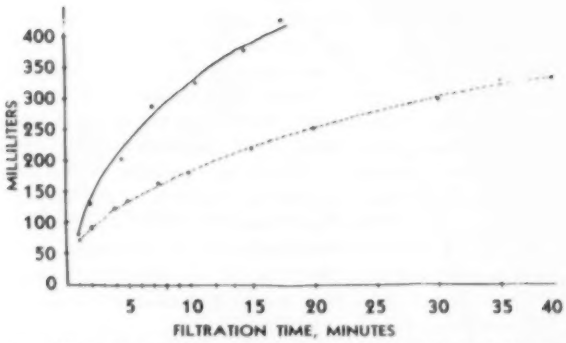
Industrial Filter & Pump Mfg. Co.

Figure 7



Solid Line Precoat Only. Dotted Line Precoat and Body Addition. 1.0–1 Ratio

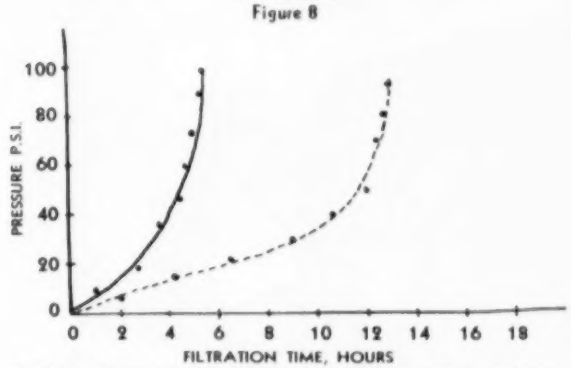
Figure 8



Dotted Line Precoat Only. Solid Line Precoat and Body Addition 1.5–1 Ratio

Filtration of Concentrated Copper Cyanide Waste Containing Excess Lime & Activated Carbon Pressure 12 PSI Constant Filter Area 0.0156 in^2

Figure 9



Solid Line Precoat Only. Dotted Line Precoat and Body Addition. 2.0–1 Ratio

Filtration of Mixed Waste Containing Nickel, Zinc, H_2SO_4 & Alkali Pressure vs Time Flow Rate 30 GPH/$Ft.^2$ Constant

Figure 10

mixture treated with air to oxidize approximately 2 per cent to 5 per cent of the iron to the trivalent stage. Air blowing periods of approximately 15 minutes or less were employed to obtain this degree of oxidation at an optimum temperature of 105° to 120° F. Such conditioning of the slime materially improved cake thickness and rate of filtration.

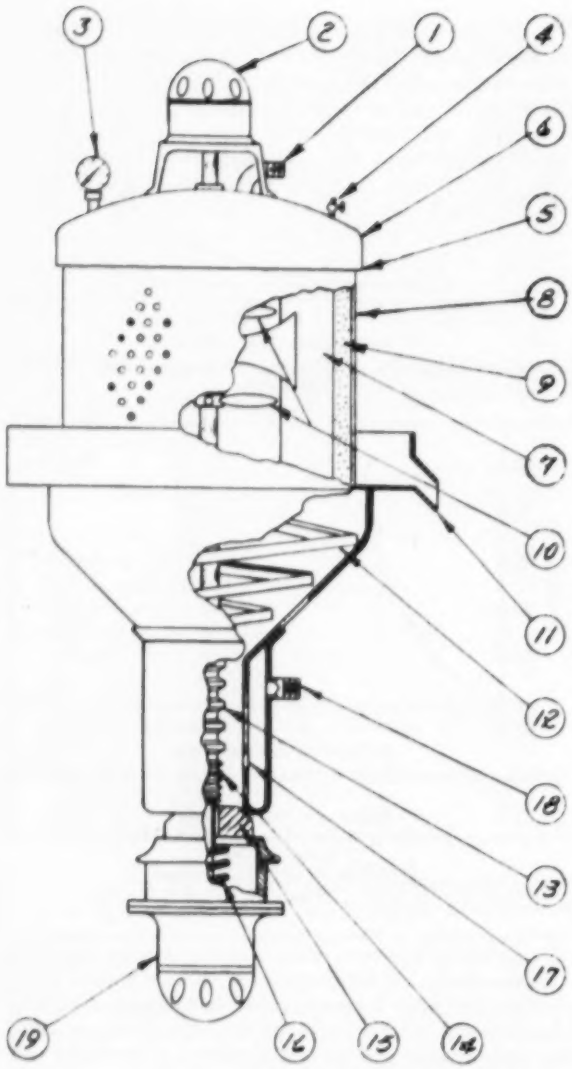
PRESSURE FILTERS

The electroplating industry is undoubtedly most familiar with this type of equipment since practically all filtration of electroplating solutions is accomplished with pressure filters of one type or another. The principle is simple involving nothing more than the introduction of the liquid to a filter membrane by pressure invariably supplied by the pump. Pressure filters have higher capacity per unit of area and are especially desirable in waste treatment for noncompressible solids. Initial cost is generally lower than for other types of filtration equipment, and operational and maintenance expense compares favorably.

The plate and frame press was one of the first types of pressure filters used by the electroplating industry and had the appeal of simple construction. While unit cost was low, operating costs were high especially the maintenance involved in cleaning and recharging the equipment. The plate and frame press has been replaced almost entirely in the electroplating industry by the enclosed shell type of filter illustrated in Fig. 6.

The vertical shell pressure filter used so successfully for the clarification of electroplating solutions is not entirely satisfactory for the volume of solids encountered in the large scale treatment of metal finishing wastes. A modification of the vertical shell filter is the horizontal shell pressure type filter shown in Fig. 7. The horizontal shell filter is better suited for waste treatment requirements because of the larger unit area, wider spacing between the filter leaves, accessibility to filter leaves, dry cake discharge, and mechanical features such as quick-opening doors, and vibrators for mechanically cleaning the leaves. Where unusually heavy volumes of liquid and solids are involved, two or more horizontal shell filters can be connected in parallel. For continuous treatment plants, parallel arrangement of two or more filters is likewise desirable so that there will be no interruptions of the process while the equipment is being cleaned. Horizontal shell filters of this type can be erected in such a manner to discharge the dry cake onto an endless belt or tote boxes for disposal.

Conditioning of sludge prior to separation by pressure filters does not have the same advantages found in vacuum filtration. This statement is made with our present knowledge of the application of pressure filters to metal finishing wastes, but because of the complexity of the problems and the ever occurring number of new problems, it could easily be contradicted. The basic consideration in pressure filtration is to limit its application to noncompressible solids or by the continuous or intermittent addition of filter aids such solids will be mechanically conditioned to retard sliming or compressing. Figs. 8, 9, and 10 show a typical laboratory filtration analysis illustrating a common waste filtered with and without the addition of filter aids.



Industrial Filter & Pump Mfg. Co.

Figure 11

1. Inlet
2. Shaft drive (varispeed)
3. Pressure gauge
4. Air relief
5. Inside normal liquid level
6. Air float chamber
7. Self adjusting cutting blade
8. Perforated surface of filter section
9. Accumulated solids acting as filter surface
10. Sludge "pushers" attached to shaft
11. Filtrate run-off
12. Ribbon worm in concentrator section
13. Screw (wide pitch pick-up end)
14. Screw (close pitch expeller-stuffing box end)
15. Stopper plug
16. Plug spring
17. Leaching holes
18. Inlet for leaching or "sweetening off" jacket expeller section
19. Screw drive (vari-speed)

CONTINUOUS PRESSURE FILTERS

The widespread interest in automation has prompted some manufacturers of filtration equipment to design systems combining the advantages of pressure type filters with the self-cleaning features common to vacuum filters. One development in this direction is shown in Fig. 11. Like some drum type rotary vacuum filters, this continuous pressure system is dependent upon a precoat whereon solids are deposited and continuously removed by a scrapper. In the system illustrated, solids are introduced in the top of the cylinder, deposited on the precoat material supported by a perforated shell where the clear filtrate is removed while the solids are permitted to settle. The self-cleaning feature is accomplished by a continuously rotating scrapper which is automatically adjusted to accommodate varying quantities of solids. Solids are directed to the apex of the conical bottom by means of a rotating element where they are compressed and discharged.

Any discussion of the treatment of electroplating wastes would be incomplete without again mentioning that the ideal method of treating such wastes is to eliminate the source. Many plating solutions are subject to both inorganic and organic contamination which, if not removed, would necessitate frequent dumping. Without the purification methods commonly used today, the problem of disposal would be many times increased. Solids-liquid separation in such purification methods are invariably accomplished by filtration. Such equipment is necessary, therefore, in not only the treatment of waste liquors but of even greater importance necessary to the prevention of waste liquors.

R. F. LEDFORD

Ledford

Ledford became interested in metal finishing while attending Western Michigan College. Beginning with his freshman year until shortly after graduation, he worked for the Kalamazoo Plating Co. attaining the position of production manager of the Kalamazoo Plant and general manager of the Battle Creek Plant. In 1943 joined Hanson-Van Winkle-Munning Co. In 1951 joined Sunbeam Corp. as superintendent of finishing and in 1952 joined the Industrial Filter and Pump Mfg. Co. as sales manager. Ledford is a member of the Electrochemical Society, the American Ordnance Association, Chairman of Sub-Committee III of Committee B-8 ASTM, and a present member and past president of the Chicago Branch, AES.

LEA LIQUABRADE

finishing for EKCO®

The LEA GROUP
serving the Finishing Field
The Lea Mfg. Co., Waterbury, Conn.
Lea-Michigan, Inc., Detroit
Lea-Ronal, Inc., Long Island City, N. Y.
Lea Mfg. Co., of Canada, Toronto
Plating Polishing Buffing Burring

STAINLESS STEEL is it . . . and this year is the big year for stainless flatware. And one of the really big names in stainless flatware is Flint Deluxe by Ekco. It's beautifully styled, beautifully made and beautifully finished.

And for finishing these gleaming stainless steel pieces, EKCO uses Lea Liquabrade and Lea-Engineered Spray Buffing Equipment. It's a high speed, low cost way to get a top quality finish.

For real finishing line efficiency, you can't beat a Lea Spray Buffing installation . . . may we send you complete details on this money saving set-up.

LEA [redacted]®
POLISHING WHEEL CEMENT
matching the high quality of other Lea Products, is now obtainable through
LEA-MICHIGAN, INC.
14066 Stansbury Ave., Detroit 27, Mich.

Burring, Buffing, Polishing, Lapping, Plating and Spray Finishing Manufacturers and Specialists in the Development of Production Methods, Equipment and Compositions. Manufacturers of Lea Compound and Learok. Industry's quality buffing and polishing compounds for over 30 years.

LEA®

THE LEA MANUFACTURING CO.
16 CHERRY AVE., WATERBURY 20, CONN.

Lea-Michigan, Inc., 14066 Stansbury Ave., Detroit 27, Mich.
Lea Mfg. Company of Canada, Ltd., 370 Victoria St., Toronto 2, Canada
Lea-Ronal, Inc., Main Office and Laboratory: 42-48 27th St., L.I.C. 1, N.Y.
Manufacturing Plant: 237 East Aurora St., Waterbury 20, Conn.

Are you interested in Plating Specialties? **SEE THE OTHER SIDE OF THIS INSERT.** ➡

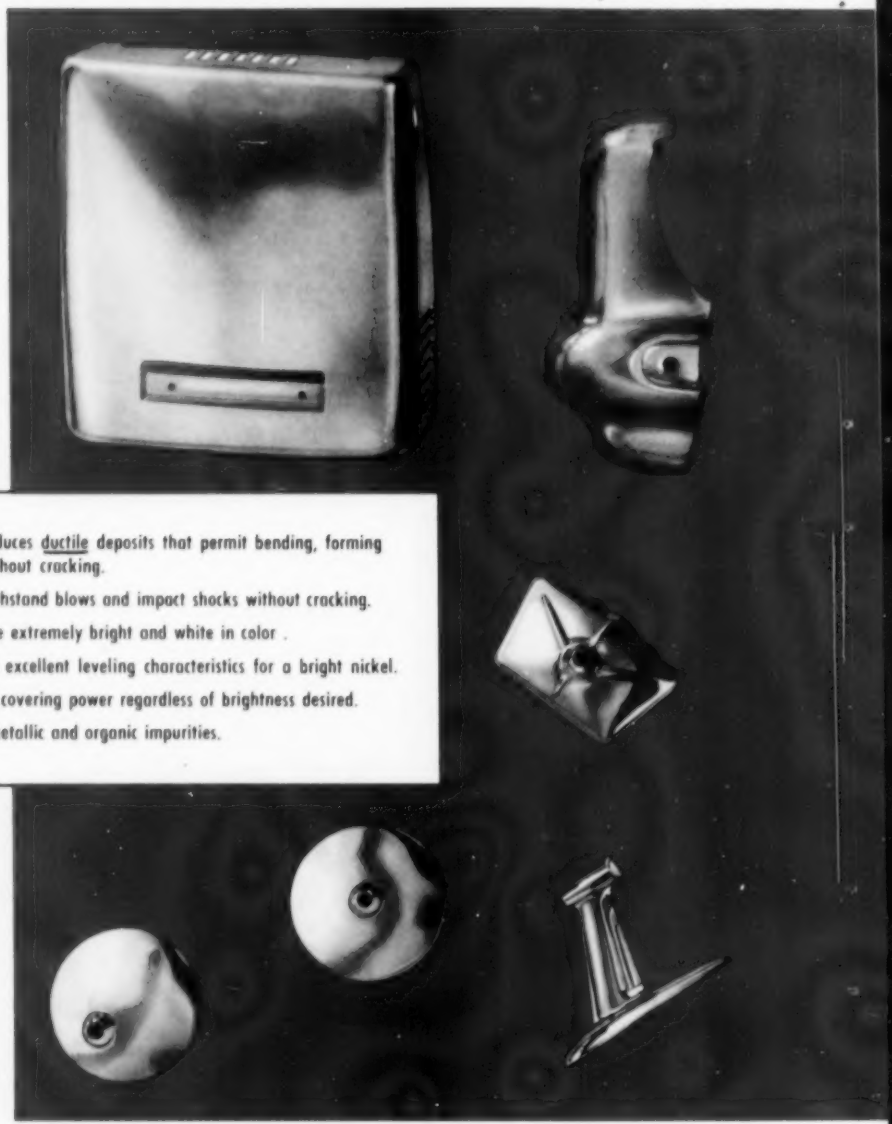
ANNOUNCING!

Lea-Ronal

Bright Nickel Process

You Get { Extremely Ductile Deposits / Brilliance / Leveling

Would such a nickel plating process meet your objectives better than the processes and solutions you are now using?



Here are some of the Lea-Ronal Bright Nickel advantages:

- Lea-Ronal Bright Nickel produces ductile deposits that permit bending, forming operations, and welding without cracking.
- . . . ductile deposits that withstand blows and impact shocks without cracking.
- . . . ductile deposits that are extremely bright and white in color .
- Lea-Ronal Bright Nickel has excellent leveling characteristics for a bright nickel.
- . . . has high throwing and covering power regardless of brightness desired.
- . . . has high tolerance to metallic and organic impurities.

You can easily convert your present nickel plating methods to the Lea-Ronal Bright Nickel Process, using Lea-Ronal Nickel Gleam Addition Agents as brighteners. Our process serves equally well for either still tank or barrel plating.

Place a trial order for Lea-Ronal now. Make a competitive test with one tank or barrel now being used in your present production schedule. Then note the difference in results . . . and costs!

Lea-Ronal *Inc.*

Sales and Manufacturing Plant:
337 East Aurora Street, Waterbury 15, Conn.
Main Office and Laboratory:
42-46 27th Street, Long Island City 1, N. Y.

The LEA GROUP
serving the Finishing Field
Lea-Ronal, Inc., Long Island City, N. Y.
Lea-Michigan, Inc., Detroit
The Lea Mfg. Co., Waterbury, Conn.
Lea Mfg. Co., of Canada, Toronto
Plating Polishing Buffing Burring

Are you interested in Buffing, Polishing and Burring Specialties? SEE OTHER SIDE OF THIS INSERT.

Are you interested in Plating Specialties? SEE THE OTHER SIDE OF THIS INSERT.

aes research project no. 15

Progress Report on Accelerated Corrosion Tests for the Performance of Plated Coatings*

W. L. PINNER†

This is the second progress report rendered on behalf of the Project Committee. The reader is referred to the previous report[1] which includes such matters as the background information and the research program visualized at that time. In brief review, there were three principal phases or assignments to be carried out. The first of these was the design, fabrication and service exposure of plated parts. The second was the gathering of pertinent environment data thought to contribute to the deterioration of plated coatings in the Detroit, Michigan area. This was the exposure site recommended for study by the Advisory Committee. These two phases of the Project are completed.

The third phase, which is the specific objective of the Project, is the actual development of a new accelerated corrosion test. In the previous report, 12 concepts of test procedures were listed. These concepts were to be actively worked upon with the thought of developing vital information pertinent to the end objective. A very considerable amount of experimental work has been carried out and, as of the time of this writing, the list of possibilities has been altered with the elimination of certain items and the addition of others. The principal purpose of this report is to deal in detail with this phase of the Project.

It is pertinent to again emphasize that the Project Committee is thoroughly aware of the real need of the metal finishing industry for a valid test which, within itself, is reproducible and of equal importance, will faithfully predict service behavior of plated coatings. At the same time, the Committee is equally aware of the necessity of avoiding the confusion created by, and the pitfalls existing in the so-called standard salt spray test, as presently defined by the American Society for Testing Materials.

The limitations of this test are now well recognized not only by this Society but also by the American Society for Testing Materials. The Committee would be delighted to be able to predict that a better test will be available shortly. It cannot do so. The assignment is a gigantic one which is complicated by an untold amount of variables. If the Committee, through its work, had actually settled on some one test at this time, it would still be necessary to carry out very extensive and time consuming checks on the test, within itself, and its calibration in terms of service life.

In its work, the Committee has made certain observations and has arrived at certain concepts which appear to be basic and interesting. For example, it is believed that a necessary condition, attendant upon the deterioration of plated coatings, is, first of all, that the surface must be made wettable. Secondly, the wettable surface must be exposed to an environment which will either mechanically or chemically cause failure to occur. Peculiarly enough, certain unfavorable conditions in the Detroit area in the wintertime will, in themselves, effect a rapid corrosion test. Substantial thicknesses of decorative coatings have been known to deteriorate in a few days if the part is first subjected to abrasion, so as to be wettable, and then be exposed to a continuous humid atmosphere in the presence of corrosive chemicals.

*Presented at the 42nd Annual AES Convention, Cleveland, Ohio. Discussions following the presentation and not included here, but will appear in the "Annual Proceedings AES, 1955."

†Manger, Houdaille-Hershey Corporation, Process Development Division, Detroit, Michigan.

This could occur, for example, on an automobile bumper closely following another car at a time that salt has been used on the street for deicing purposes. The slush thrown up by the car ahead contains abrasive materials and other corrosive substances which will coat the bumper. All that remains is for the car to be stored in the garage at a temperature of about freezing, when the humidity is high. Deterioration of the coating will occur rapidly.

Later in the paper a test will be outlined in which the action, just described, is carried out on a controlled laboratory basis. It has been noticed that, if a pure abrasive such as aluminum oxide is substituted for ordinary dirt, and if distilled water and C.P. sodium chloride is used, rusting does not occur after exposure to a humid atmosphere. If however, ordinary dirt is substituted for the pure abrasive, then rusting will occur. One might theorize that the salt itself is merely an agent which releases some corrosive chemical from ordinary soil.

Another peculiar observation related to the effect of exhaust fumes from an automobile. A plated piece held close to the exhaust pipe in a new car is not damaged unless the motor is suddenly accelerated. In this case and in the case of an old car, known to be burning oil, the exhaust fumes will cause rusting on a part subsequently exposed to a humid atmosphere for 24 hours. These are a few of the interesting and sometimes curious observations that have been made during the course of the work.

Figure 1 is a photograph of one of the mobile test site panels, of which some 600 were placed on taxicabs in Detroit during the winter of 1953-54. This photograph shows the extent of deterioration occurring on a plated diecast panel after a four week exposure. Considerable failure of the plated coating will be noted in the area where the plate was subnormal in thickness. The breakoff point is at a total thickness of approximately 0.001 inch. It will be recalled that the test panels were plated with graded thicknesses varying from about 0.0003 inch, at one end, to 0.002 inch at the other end. Figure 2 shows the condition of a nickel and chromium plated steel panel after being exposed twelve weeks in service. The same type and extent of failure will be noticed on this as is evident on the diecast panel. It is interesting to record the observation, on the part of the Committee, to the effect that plated diecast parts failed at least as badly and sometimes worse and more quickly than steel panels.

The various tests which have been under consideration will now be discussed.

TEST No. 1

This involved testing such as salt spray or humidity at low temperatures and in the presence of corrosive gases such as SO_2. This test has been discontinued. The apparatus was difficult to operate and corrosion results did not appear promising.

TEST No. 2

The continuous immersion of test specimens in solutions made up to represent what might be encountered in service. Work on such a test method has been deferred. Any type of an immersion test is not considered to be too promising on production parts, because of the galvanic effects on uncoated areas. Should other more promising tests prove to be unsatisfactory, it is possible that this type of test-

Fig. 1. Panel No. C1286—4 weeks Exposure on Taxi 1-20-54 to 2-17-54

Fig. 2. Panel No. 317—12 weeks Exposure on 9.M. car 12-15-54 to 3-9-55

ing might be given another look, in which case an acetic acid immersion test might be considered.

TEST No. 3

The exposure to solutions of various corrosive compositions, followed by exposure in a humidity cabinet with or without the emission of corrosive gases. This general concept is being actively considered and is of sufficient importance that separate test numbers have been assigned to specific methods which will be discussed later.

TEST No. 4

The chilling of parts followed by spraying with solution simulating early rain, containing dust, and then returning to the chilling chamber. This test was conceived on the basis that it does simulate, at times, actual service conditions. Corrosion did not occur rapidly so that the method held little promise.

TEST No. 4A

Chilling followed by spray with solution simulating early rain followed by humidity exposure at high temperatures. Activity on this method is deferred. Results appeared to have some promise but other active tests are considered more promising and therefore are receiving immediate attention.

TEST No. 5

Modification of the salt spray test such as intermittent operation, substitution of O_2 or CO_2 for air or adjustment of *p*H by acids other than acetic. This test has been discontinued in favor of others which will be described.

TEST No. 6

Addition to the test environment, for example, the salt spray, of solid particles such as ash, dust and soot. This method has been discontinued. The test was found to be extremely corrosive, would be difficult to control and it is suspected that the method would actually create weaknesses in the plate rather than reveal existing ones.

TEST No. 7

Use of a gelatin film as a means of holding corrosive media and solid particles in contact with the part while subjected to a spray or other corrosive environment. This test has been discontinued. The results were not promising and some even indicated that the gelatin film was protective against corrosion.

TEST No. 8

Exposure of specimens to a moist atmosphere carrying sooty smoke, followed by further exposure to a moist atmosphere. This test was discontinued because it was extremely corrosive and would be extremely difficult to control.

TEST No. 9

The exploration of the effects of temperature on galvanic potential relationships against basis and coating metals. The test has been discontinued. It is considered that an investigation of these effects might well reveal data of value, but the method itself is not a measure of quality.

TEST No. 10

A study of the effect of wetting agents to favor penetration of corrosive media into fine pores or cracks. This test has been discontinued. Negative results were obtained and in some instances wetting agents were found to actually inhibit corrosive attack.

TEST No. 11

The examination of plating specimens with respect to the amount of current required to prevent corrosion in testing media. The test has been discontinued. Similar to Test No. 9, the investigation might supply interesting data, but is not in itself a measure of quality.

TEST No. 12A

A study of the elimination of positional effects in spray boxes by moving specimens or nozzles, or both. This test may actually be incorporated in others which are active, but has been deferred as far as an investigation of the effect in a salt spray test is concerned.

TEST No. 12B

Investigate effects of oxidizing agents other than air in promoting breakdown of coatings in appropriate media. This test may be considered either deferred or incorporated in other active methods.

TEST No. 12C

Investigation of waterline effects in connection with immersion tests. This test is deferred at least until immersion tests are considered worthy of activity.

TEST No. 13

Hot water immersion tests, either continuous or cyclic. This test is at least deferred while other more promising ones are investigated.

TEST No. 14

The acetic acid modification of the salt spray test. This test is active. Results appear to be quite promising on the basis that corrosion patterns appear to much more nearly duplicate actual service corrosion than is obtained with the old salt spray test. In its active consideration, the Committee recognizes the necessity for investigating all of the limitations known to exist in the present salt spray test. Matters of reproducibility within a single box

Fig. 3

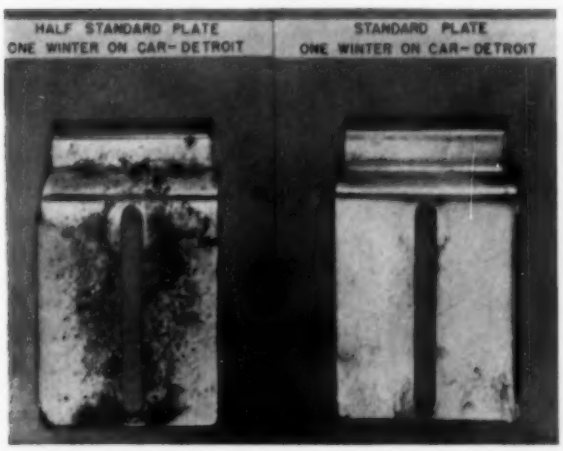
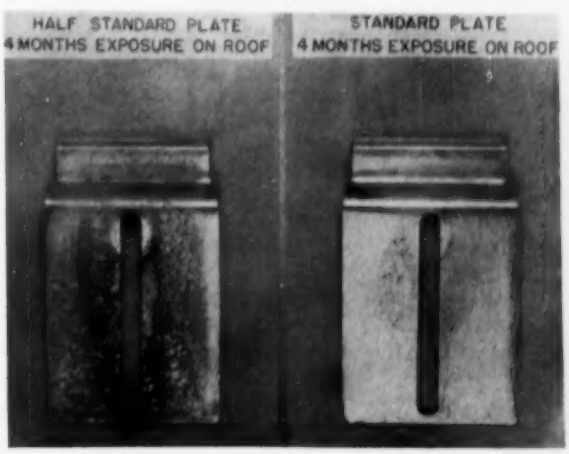


Fig. 4



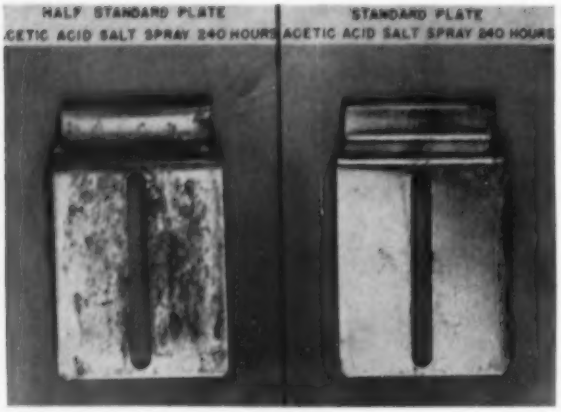


Fig. 5

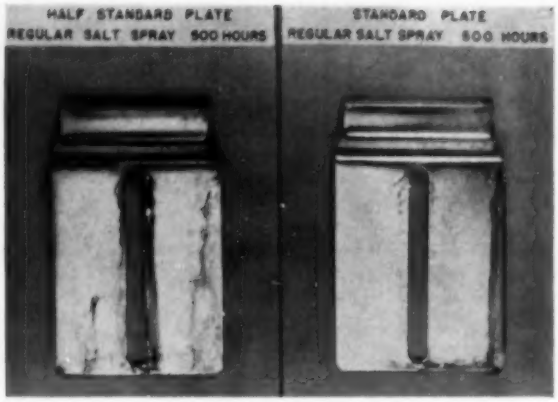


Fig. 6

or between individual boxes are receiving active attention. Should the test appear to be reproducible, there would be removed one of the outstanding objections to the present salt spray test. The next step might conceivably involve a correlation of the test results with good, bad and indifferent plating practices and also with service exposure.

Figures 3 to 6 are photographs of test panels which show the similarity of corrosion pattern obtained in the acetic acid salt spray test to service and weather exposure. Each of these photographs show two panels, one of which is coated with a normal thickness of copper-nickel-chromium such as might be specified for service use by the automobile industry. The other panel is coated with one-half standard thickness of plate applied so that corrosion of the basis metal would occur in a shorter time. In Figure 3 the condition of these panels are shown after a service of one winter on an automobile in Detroit. Figure 4 are duplicate panels showing their condition after four months static exposure on a roof in Detroit. Figure 5 shows duplicate panels after exposure to the acetic acid salt spray for 240 hours. Figure 6 are the results obtained after 500 hours exposure to the present salt spray. It will be noted that the corrosion pattern in the acetic acid salt spray is very similar to that obtained in actual outdoor exposure.

TEST No. 15

A cycle test, for example various periods of time in salt spray, infrared exposure, chemical immersion, etc. Such a test method has been deferred in favor of others which would be more simple and which would not require complicated equipment which would have to be constructed in order to carry out such an investigation.

TEST No. 16

The electrolytic corrosion test. This procedure was fully described in a recent publication.[2] It consists briefly in making the part anodic in a dilute salt solution and with an impressed voltage lower than that of the solution potential of the metal involved. The test is active and bears promise with the restriction however that it will probably be applicable to research work only. This restriction is for the reason that, in heavy commercial coatings, the difference in plate quality shown by this test are at times insignificant. In thinner coatings which might be used for research purpose, the test does reveal quality differences as affected by process variables. Figure 7 is a photograph of the apparatus in use on a production part. This photograph is duplicated from the publication already referred to.

TEST No. 17

This is known as the British sulfur dioxide test which consists of suspending pieces over warm distilled water in a closed container, to which SO_2 solution is periodically added. This test is active and is being used in some applications in England. Delays in obtaining and setting

Fig. 7

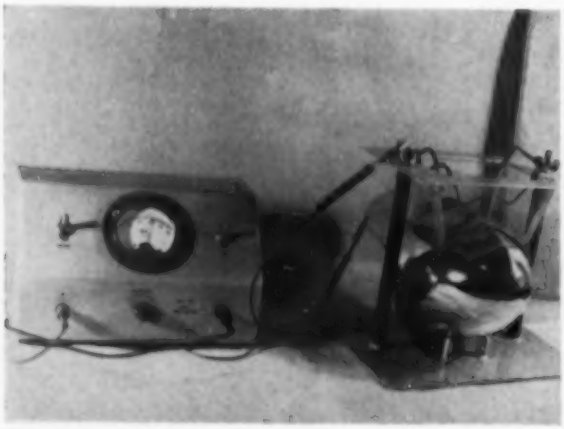
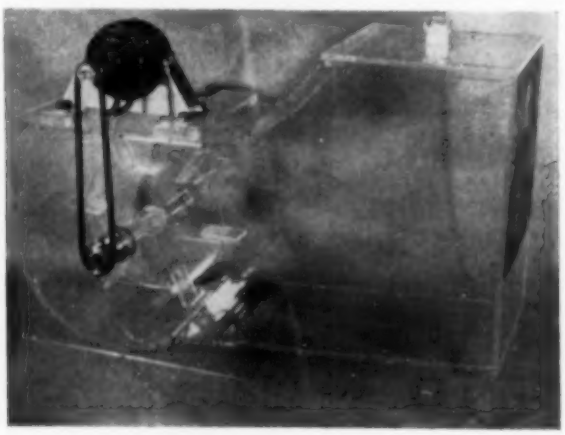


Fig. 8



up the apparatus have restricted test results up to the present time.

TEST No. 18

This is actually a variation of Test No. 3 and is designated as a road slush splash test followed by humidity exposure. An effective way to reproduce the winter road by means of a splash chamber, in which a conditions of Detroit and similar areas is revolving paddle sprays a plated part with a mixture of salt water and dirt. The chamber, shown in Figure 8, may be constructed of Lucite or similar material, with bearings designed to prevent entrance of corrosive solutions. Six paddle blades, 1.5 x 2 inches, revolving on a 10-inch diameter at about 600 rpm, can cover an area of 112 square inches with a typical road spray at a distance of 18 inches, measured from the center of rotation. The chamber should be designed to drain the salt solution into a well in which the paddle is spinning. A satisfactory pitch for drainage is $\frac{1}{2}$ in/ft. The paddles should enter the well with a clearance of $\frac{1}{2}$ inch and leave with a clearance of $\frac{1}{4}$ inch. The starting solution level in such a well should be about $1\frac{1}{4}$ inches at the deepest point.

The solution to be used in the splash chamber can be varied in composition within the limits of the construction materials. Usually the basic liquid is salt solution. Clay soils, sand, and even small pebbles, may be added to the solution to provide abrasive and coating action. When using natural clay soils, it will be found that they may yield a very corrosive mixture when acted upon by concentrated salt solutions. This degree of corrosiveness may be fugitive or of a semi-permanent nature. It is best checked by redox potential measurements.

Parts may be exposed to the action of the splash chamber as long as necessary to wet the surface. Clays and abrasive soils will coat the usual chromium-nickel finish in about 15 minutes. After the surface has been wetted, it may be subjected to any humidity condition desired. Simple abrasion and surface damage tests can be made by prolonging the time of exposure in the splash chamber. Positional effects and the influence of shape and design upon the buildup and location of areas of concentrated soil may also be studied in the splash chamber. Actual rates of drying over irregular surfaces may be determined after parts have been removed.

The splash chamber is a very convenient means of bringing road conditions into the laboratory. The variety of problems that may be studied is limited only by the interests of the experimenter.

TEST No. 19

This test is designated as a German corrosion test consisting of suspending test pieces in closed containers in an atmosphere consisting of SO_2, CO_2 and water vapor. It is understood that this test is being used for certain applications in Europe. The test is being actively investigated, although similar to Test No. 17, the delay in setting up the equipment has penalized results as of this time.

TEST No. 20

This test is a further variation of Test No. 3. It consists in applying a synthetic soil to the plated surface by rubbing, followed by humidity exposure. Corrodkote is the name given to synthetic road soils in paste form, applied to plated surfaces as a test of corrosion resistance. A Corrodkote formulation usually includes both soluble and insoluble elements and sufficient liquid to give proper spreading consistency. Corrodkote is applied to the surface being tested by means of a cotton pad, or similar device, to produce a fairly uniform coating, after which the coated specimen is exposed to specified humidity conditions.

A typical Corrodkote mixture, effective in testing chromium-nickel combinations over steel, is:

Kaolin—30 g
Sodium Chloride—15 g
Ammonium Chloride—15 g
50 ml of water containing
2 g/l of potassium fluoride

Any number of chemical entities may be employed in mixtures such as the above. Some that have been tried are sulfur, potassium bromide, potassium iodide, calcium chloride, ammonium sulfate, acetic acid, 4 methyl thiouram disulfide, potassium permanganate, and sodium sulfite. Kaolin is a very convenient base for Corrodkote mixtures as it adheres well to plated surfaces. Its adherence characteristics may be modified by the agents mixed with it, however. For example, added sulfur (flowers) makes a very sticky paste, whereas sodium sulfite decreases the wetting ability of the Kaolin. The coatings need not be applied with extreme care. In many cases the salts in the Corrodkote mixture are present in excess of solubility. This permits the proper humidity conditions to create a homogeneous layer over the test areas. The manner of humidity exposure is therefore the most critical part of the test. Though the surface must be moist, it must not become wet enough to wash out the salts. This is accomplished by keeping below the dew-point and by allowing the coating to dry thoroughly before placement in humidity.

A simple form of humidity chamber, described below, will give the highest possible relative humidity, short of the condensation point. An effective chamber consists of a water-sealed cabinet enclosing a water reservoir, air heating element, an air circulating fan. The fan, motor driven from the outside, blows air over the heater and across the water pan in the bottom of the cabinet. If not excessively disturbed, this system will provide nearly 100 per cent relative humidity without undue condensation and yield uniform, reproducible results on Corrodkoted test pieces. Any temperature may be employed, but the most work has been done at 100° F.

Corrodkote testing devolves then into three simple steps:

1. Selecting a Corrodkote formulation approaching the desired corrosive agents and activities.
2. Applying the selected coating to the surfaces to be tested.
3. Exposing the test pieces to proper humidity conditions.

On steel-base systems, rusting will be visible without any removal of the Corrodkote. On diecastings, and other base metals whose corrosion products are white and where blistering and pitting are suspected, the coating may be rinsed off for examination and then re-applied if further exposure is desired.

This report is submitted on behalf of the Project Committee by its Chairman.

REFERENCES

[1] "Progress Report on Development of a New Accelerated Corrosion Test," W. L. Pinner, Proceedings AES 1953, pp. 148–152.

[2] "An Electrochemical Method for Evaluating Plated Coatings," W. J. Pierce and W. L. Pinner, Proceedings AES 1954, pp. 176–184.

W. L. PINNER

Pinner

Pinner was graduated from the University of Michigan in 1923 with a B.S.E. in Chemical Engineering. Upon graduation, he was employed by the Houdaille-Hershey Corporation; and, at present, is manager of the Process Development Division; is a member of the ASTM; Chairman of Subcommittee II of Committee B-8; ASM; Electrochemical Society; NACE; Metal Finishing Industry Action Committee of ORSANCO; Honorary Member of the Institute of Metal Finishing of England; held all offices of the Detroit Branch, AES and National Society, having served as President in 1945. He is presently serving as Chairman of Research Project 15, and is the only member of the Society to have been given four gold medals and one cash award for five papers which were considered outstandingly qualified. He has published 25 technical papers and has 10 patents, all of which have been assigned to his Company.

WATER PURIFICATION WITH ACTIVATED CARBONS

W. A. Helbig*

Activated carbon is a special form of carbon having a very large area contained in a small volume and designed for the purification of gases and liquids.

The property of picking up and holding constituents in liquids and gases is possessed to some degree by most products made by the charring of organic matter. The principle involved is illustrated in the use of carbon in gas masks and in the aging of whiskey in charred kegs. A recent use is illustrated in the production of activated carbon filter tips for cigarettes.

There are in reality two classes of activated carbon, which differ markedly from each other in their method of manufacture and in the uses to which they are put. The first of these is the class of gas adsorbent carbons. These are almost invariably made in granular form and are characterized by being quite hard in texture and by having extremely small pore openings. They are not at all well suited for the adsorption of large molecules and are, therefore, in general not good decolorizing materials. The so-called decolorizing carbons are supplied mostly in finely powdered form; when they are furnished in granular form, they are somewhat softer in texture than the gas adsorbent carbons. This property arises from the fact that the decolorizing type of activated carbons has pore openings considerably greater in size than the gas adsorbent type.

Both types of activated carbons are made by destructive distillation of an organic raw material. Gas adsorbent carbons may be made from hard raw materials such as coconut shell or they may be built up by using a softer material mixed with a binder which is then extruded, cut into small lengths and activated. The raw materials used for the decolorizing type carbons include such products as lignite, wood, animal bone, and paper-mill waste liquor.

Destructive distillation is a process in which the raw material is subjected to heat in the absence of air. Under such conditions the organic matter is broken down, and volatile substances such as moisture, tars, carbon dioxide, and lower boiling products are driven off by volatilization. A porous charcoal-like mass remains. This has a certain degree of adsorptive power which is enhanced by treating it with a mild oxidizing agent such as steam or carbon dioxide. Such oxidation burns off the residual tars remaining on the surface created during the destructive distillation. The oxidation also increases the area which was initiated during that process.

A good activated carbon will have an area on the order of 50 to 150 acres per pound. It is this area which makes the carbon an effective purifying agent. When it is used in the purification of a liquid such as water, impurities that may be present are held on this surface by the force of adsorption. If a powdered carbon has been used, the impurities leave the liquid with the carbon when it is filtered out. If a granular carbon has been used, the liquid percolated through the granular bed is freed of impurities as it travels through the bed.

The adsorption per unit of area is quite small, but the very large area presented by activated carbon makes it possible to effect sizable degrees of purification with relatively small weights of carbon.

For industrial water treatment, activated carbon is most commonly used in granular form. The best granule size is in the range of 12 x 20 mesh; i.e., the granules will pass a screen

*Chemical Engineer, Chemicals Division, Atlas Powder Company, Wilmington, Delaware.

having 12 openings per linear inch and will be retained on a screen having 20 openings. Experience has shown that this mesh range provides the best compromise between ready accessibility to the activated carbon surface on the one hand and permeability of the bed to ready flow of water through it on the other hand. Beds of activated carbon for water treatment are normally 24 to 36 inches deep, and the flow rate applied is commonly 1 to 1.2 gal/cu ft/min.

Granular activated carbon suitable for such use, should be washed with acid and with water in the course of its manufacture to eliminate from it inorganic contaminating materials such as calcium, magnesium, aluminum and other common metals which would otherwise be transferred to the water being purified and cause difficulty by their presence. The carbon should be activated to have pore size openings ranging from the relatively small type used for adsorption of phenolic type compounds, to the larger pores admitting more complex molecules which might cause odor, taste, or pollution in a water being treated. The carbon should be dense enough so that when the bed is backwashed, (as it needs to be periodically in order to keep the carbon from becoming too compacted), there will be no loss of carbon in the up-flowing stream of backwash water. A commonly accepted bulk density figure is 20 lb/cu ft. At that density a 12 x 20 mesh material will not be carried out of a granular carbon bed at backwash rates of 10 to 12 gal/cu ft/min.

Activated carbon is strongly electro-positive toward metals. It should not, therefore, be housed in metal filter shells without lining the internal surface so as to keep carbon out of direct contact with unprotected metal. If this is not done, severe corrosion may result, causing destruction of the filter shell and gross contamination of the water passing through. Suitable protective linings are found among many of the organic coatings available for corrosion protection of metals.

When a bed of activated carbon is first put into service, it should be thoroughly backwashed with water to eliminate the small amount of fine dust that is unavoidably associated as a coating on the granules. Once this dust has been removed it will not recur.

Electroplating plants using powdered activated carbon for maintaining purity in the plating bath can use this same carbon for water purification. The best procedure is to follow the precoat method, in which the powdered carbon is deposited as a precoat in a filter and the water flowed through this for treatment. The procedure is described in detail in the article "Physical Removal of Impurities from Plating Solutions."* Such application permits the use of existing equipment without the necessity of purchasing special granular carbon filters and auxiliary apparatus.

Over the years the writer has had several experiences in which organic contamination of water proved quite troublesome in securing good plating operation. Probably the most striking of these was an acid zinc bath used for continuous plating of steel wire. This was a 10,000 gallon bath in a tank that must have been 100 feet long, operated at about 130 to 140° F. Difficulty had been experienced in securing good adhesion of the zinc plate to the wire. This difficulty could be corrected by activated carbon treatment of the solution, but it recurred within 24 hours. A continuous source of "infection" was suspected but no obvious source could be found. It was not until it was realized that the evaporation loss in the long tank of warm solution was quite large, amounting to nearly one-quarter of contents of the tank per day in some cases, that water was suspected as the contaminating agent. It was ascertained that the replenishment water was added to the tank from a supply obtained from untreated lake water. This water contained from time to time effluents from a nearby tannery, a pharmaceutical plant, a brewery and a coke plant. Activated carbon treatment of the water supply turned out to be the correct solution to the operating problem.

There are not uncommon cases where the rinse water used in plating operation acquires a fairly high content of organic impurity. If this rinse water is recirculated or not changed at sufficiently frequent intervals, these impurities may cause trouble. Activated carbon treatment of the rinse water is one method of circumventing such difficulties.

The growing interest in suitable methods of handling plating room wastes has led to a fairly widespread use of ion exchange resins as means for removing metal wastes from plating room effluents either for recovery of metal values or to insure that toxic levels of harmful metals are not discharged into streams where they may be dangerous to fish life or to humans. Such resins are frequently called upon to carry rather heavy ion removal loads. Since the effluents in question frequently have appreciable concentrations of organic matter present as well, considerable interest has been shown in using activated carbon for adsorption of these organic residues, thereby protecting the ion exchange resins from contamination and weakening of their ion adsorptive capacity.

The grade of activated carbon chosen for such use may be either a powdered grade or a granular grade as described earlier in this article. The life of a bed of granular carbon or of precoat of powdered carbon used on effluent treatment may be appreciably shorter than in the case of water influent to the plating plant, because the effluent is likely to contain much higher levels of organic matter.

It is very difficult to predict what adsorptive life may be expected under a given set of conditions. However, a rough rule of thumb which serves for making approximations is that each part of organic matter present will require approximately 10 parts of carbon for its removal. This figure is helpful in calculating how much powdered carbon is required in a filter to handle a given volume of water before the precoat needs to be changed. It helps also in determining how large a bed is required and how long that bed will provide useful service when granular activated carbon is used.

The many years of experience which the electroplating industry has now had with activated carbon as a useful means for maintaining purity in plating solutions should lead the industry to realize the possibilities of activated carbon for water treatment. It is anticipated that treatment of both influent and effluent water will become increasingly common in the near future.

W. A. HELBIG

W. A. Helbig has been working with activated carbon since 1929, primarily in the development of new fields of use. Association with the electroplating industry began in 1938 with the advent of bright nickel. Helbig has also been associated with the fields of activated carbon for water purification for the production of antibiotics and sulfa drugs, and in the brewing industry. Helbig is employed by the Atlas Powder Co., Wilmington, Delaware.

*Proceedings of the American Electroplaters Society, 1941.

Convention Echoes

Dr. Blum installs the new officers

Arthur Pierdon addresses the banquet. Mr. and Mrs. Combs are at the left of the podium, Clyde Kelly and Dr. Heiman at the right while Art Logozzo hangs on

Dr. Heiman congratulates Don Isaacs of Sydney, Australia on winning the membership drive

André Waldberg, of Paris, France visiting the Plating booth where George Bumley is on duty

A written and photographic record of the convention just past

All pictures by Plating staff members

MORE than 1,500 were officially registered at the 42nd Annual Convention of the AES in Cleveland in addition to nearly 7,000 exposition registrants. Final figures have not been tabulated but it appears that the combined convention-exposition totals will exceed 8,000.

To Gene Combs, the General Chairman; Charles Ott, Co-Chairman; to Leon Westbrook, Exposition Chairman, and to Mrs. Frances Hoffman, Ladies Program Chairman, and the combined committees go deserving thanks and praise for a job well done.

Although the convention did not get underway officially until Monday, hundreds were on hand for Sunday's activities which were climaxed by the traditional "Get-To-Gether Party" at the Statler Ballroom in the evening.

The convention was called to order Monday morning by General Chairman Gene Combs, with the Reverend Frank Mesle (Syracuse Branch) pronouncing the invocation. Principal speaker was Manson Glover (Boston Branch), Past President of the Metal Finishers' Suppliers Association, whose talk was on "The Role of the MFSA and the AES."

Brief welcoming messages were given by Leon Westbrook, Exposition Chairman; A. J. Lupien, President of the Host Cleveland Branch; and Mrs. Frances Hoffman, Chairman of the Ladies' Committee.

President Ralph A. Schaefer called the formal business session to order and received reports from the Credentials Committee, Paper Awards Committee and the Resolutions Committee. Second Vice-President Samuel Heiman gave a brief report on branch membership promotion and announced Permanent Branch Charters to the following branches: Seattle-Puget Sound, Southern Tier (New York), and Capitol District (New York), bringing our branch total now to 53. Dr. Heiman awarded $50 checks to Detroit—accepted by H. Head; Sydney (Australia)—accepted by Don Isaacs of Sydney; and to Wichita—to be mailed in the absence of a Wichita representative. These branches emerged winners in the branch membership competition in 1954–55.

Following the necrology by Executive Secretary P. Kovatis, Barney Case, Chair-

man of the Paper Awards Committee, announced the winners for "best" papers in 1954. They are: *Carl E. Heussner Award*, co-sponsored by the Society and the United Platers Foundation through Trustee Glenn Friedt, Detroit, Michigan—to Dr. Ralph F. Muraca, Lehigh University, for his paper on "Determination of Free Cyanide and Zinc in Zinc Cyanide Solutions"; *The AES Silver Medal*—to Vincent P. McConnell, General Electric Co., for "Joint Strength Properties of Tin-Lead Alloy Deposits"; *The AES Bronze Medal*, co-sponsored by the AES and the Grand Rapids Branch—to K. G. Compton, R. A. Ehrhardt and G. Bittrich, Bell Telephone Laboratories, Murray Hill, N. J., for "Brass Plating"; *The Robert S. Leather Mechanical Finishing Award*, by the AES and Lea Manufacturing Co., Waterbury, Conn.—to A. S. Kohler, Frederick Gumm Chemical Co., Kearny, N. J., for "Some Considerations of Importance in Ball Burnishing"; *The Chromium Plating Award*, co-sponsored by the AES and the Nutmeg Chrome Corp., West Hartford, Conn.—to J. E. Stareck, E. J. Seyb and A. C. Tulumello, for "Stress in Chromium Deposits."

The first business session was concluded at noon with a brief review of matters to come before the Supreme Society at the final meeting on Thursday.

Final Business Session

PRESIDENT SCHAEFER brought down the gavel at 2 P.M. on Thursday to bring to order the second and last meeting of the Supreme Society.

After a roll call of National Officers and Delegates by the Executive Secretary, there was a roll call of living National Past Presidents. Those in attendance included: E. J. Musick, F. C. Mesle, H. A. Gilbertson, Frederick Fulforth, E. T. Candee, G. Wagner, W. L. Pinner, S. S. Johnston, A. W. Logozzo, W. J. Neill, C. F. Nixon, F. J. MacStoker and G. P. Swift.

A moment of reverent silence was observed in memory of Dr. Dwight T. Ewing, an AES member who contributed much to the Society's research efforts at Michigan State College who passed away during the year.

Standing Committee Appointments

PRESIDENT SCHAEFER announced the following new committee appointments: Research Committee—Robert A. Ehrhardt, Bell Telephone Laboratories, Murray Hill, N. J.; George E. Best, Mutual Chemical Div., Allied Chemical & Dye Corp.; Baltimore, Md.; Dr. Walter R. Meyer, Enthone, Inc., New Haven, Conn.; PLATING Editorial Board—Russel Harr, Western Electric, Chicago, Ill.; AES Past President Arthur W. Logozzo, Nutmeg Chrome Corp., West Hartford, Conn.; John B. Capuano, Udylite Corp., Detroit, Mich.; F. L. Scott, United Chromium Corp., Carteret, N. J. (advisor); Abner Brenner, convention liaison member (Washington), and Phil Coady, convention liaison member (Montreal).

Checking golf scores

"Duke" Wysong congratulates "Herb" Head after the balloting

Clyde Kelly thanks Mrs. F. Marquardt, on completing her 19th year as AES Convention Reporter

J. J. Reymond of Bienne, Switzerland and right, Dr. Dieter Littman, also of Switzerland

Resolutions

THE following resolutions presented by Past President George P. Swift as approved by the AES Law Committee were passed by the Supreme Society: authorization for PLATING to join the Audit Bureau of Circulation; change of designation of AES Silver Medal Paper Award to George B. Hogaboom Memorial Award; authorization for yearly branch exhibits including exposition years; authorization to increase subscription price of PLATING to non-members of the Society; National Honorary Membership to Past President George Wagner (Newark); and a set of resolutions thanking and praising the Cleveland Branch and its members for staging a successful convention and exposition; and to the MFSA, NAMF, MBFA and the many other organizations who contributed to the success of the affair.

Awards

DR. D. GARDNER FOULKE (Newark) nominated George Wagner to National Honorary Membership and Wagner received the award after a unanimous vote.

The Award of Merit went to Dr. Earl J. Serfass, retiring Chairman of the AES Research Committee and head of the Lehigh University chemistry department. Dr. Serfass also accepted the Carl E. Heussner Award in behalf of his colleague, Dr. R. F. Muraca of Lehigh University who was unable to be present. (See story and pictures in AES News.)

Election of National Officers

CLYDE KELLY, president of the American Plating Company of Des Moines, Iowa, was elected President of the Society and all other incumbents moved up a notch. Herberth E. Head, supervisor of electroplating and related operations, automotive body division, Chrysler Corporation, Detroit, Mich., became the new third vice-president.

Dr. William Blum, Bureau of Standards (retired) and National Honorary Member of the Society, installed the new officers. Clyde Kelly was awarded a silver-plated gavel, presented to the new president each year by Ted Boggess (Baltimore-Washington Branch) of the Norfolk and Western Railroad. President Kelly presented the Past President's button to Dr. Schaefer.

President Kelly presided over the remainder of the meeting which consisted of reports by convention chairmen Arthur Pierdon, Baltimore-Washington Branch; James J. Roche, Montreal; and bids for the

Texans all—but one, who is from the west (West Hartford, Conn.)

Mrs. Eddy takes a bow

Officials at the Plato party

Convention Echoes

1960 convention site by representatives of the Los Angeles, Pittsburgh, Boston and Philadelphia Branches, the latter which was tabled until the 1956 convention.

The final business session was concluded with a vote of thanks to the local convention and exposition committees and to the convention reporter, Mrs. Florence Marquardt of Milwaukee, Wisconsin.

Educational Sessions

A total of 27 papers were presented at 7 educational sessions. This included 12 papers which were given at two dual sessions. All sessions were well-attended and well-received.

Chairmen of the sessions included: first session—M. Caldwell, Dohler Jarvis Co., Division of National Lead Co.; Second Session—B. B. Knapp, International Nickel Co.; third session (dual)—John Martin, Enthone, Inc.; third session (dual)—C. R. Wheeler, Elyria Plating Co.; fourth session (dual)—Lee Morse, Chrysler Corp.; fourth session (dual)—F. Bauch, Frigidaire Division, General Motors Corp.; fifth session—Abner Brenner, U. S. Bureau of Standards.

The Social Program

Monday found conventioneers converging on the Open House, sponsored by the Metal Finishing Suppliers Association, Inc., at the Carter Hotel Rainbow Room. The congenial surroundings typified the excellent annual affair of the International Fellowship Club. There was dancing and fun 'til the early morning hours. Perennial Open House Chairman, Tom Trumbour of Finishing Publications, Inc., and his committee deserve plaudits for their efforts.

Thirty-four Michigan State Alumni attended the second annual AES convention breakfast at the Hotel Cleveland on June 22 with Dr. C. Fred Gurnham, head of the Chemical Engineering Dept., MSC, in charge of arrangements.

John Gumm of Frederick Gumm Chemical Co. and Joe Duffy of Pennsalt Co. greeted golf enthusiasts at the Sleepy Hollow Golf Club on June 21, who braved some rain and heat to compete in the Annual Golf Tournament sponsored by the MFSA. The competition was keen and a quick look at the scores will attest to the fact that the results were close.

Wednesday evening's show and dance at the Statler Ballroom featured Charlie Spivak and his famous orchestra. In addition to some fine music, the affair also featured Randy Brown, the paddle-ball Texan and an excellent array of headline acts arranged by Jack D. Little, Entertainment Chairman, of McGean Chemical Company, Cleveland.

The Annual Banquet on Thursday evening at the Rainbow Room at the Hotel Carter brought the week's activities to a fitting climax. A delicious meal with all the trimmings was served in a backdrop of dinner music from a fine girls' orchestra. The banquet was over by 10 P.M. and gave conventioneers a good opportunity to make a final visit to the entertainment headquarters of hospitable suppliers who contributed much to the success of the 42nd Annual AES Convention and 4th Industrial Finishing Exposition.

Among the various prizes awarded during the week were those by the following firms: Wagner Brothers, Detroit, Michigan—Custom High Fidelity Audio Equipment won by Ray D. Andrews, New York. (See story in Industry News.) Hanson-Van Winkle-Munning Company, Matawan, N. J.—*1st prize*, five piece Silver Tea Set, won by Grant O. Turrill, California; *2nd prize*, Kodak Signet 35 won by Harold A. Hosking, Conn.; *3rd prize*, Black and Decker Deluxe Drill Kit won by Mrs. J. T. Hyduke, Ohio.

Meetings of Society Committees

On Sunday, the AES Executive Board convened at the Statler Hotel in a 10-hour meeting; the PLATING Editorial Board met on Monday, also at the Statler; and on Wednesday, the AES Research Committee held its regular meeting under the leadership of the new chairman, Les Borchert of Houdaille-Hershey Co., Detroit, Mich. Twenty-seven Branch Secretaries met on Wednesday also in a lively and most interesting meeting. The Branch Librarians met jointly with instructors of plating courses on Tuesday with Clyde Kelly presiding.

Meetings of Related Organizations

As has been the custom, groups and organizations related to the American Electroplaters' Society, held their annual business meetings during the convention. Here is a summary of their activities:

MFSA

The Metal Finishing Suppliers' Association held its annual business meeting. New officers elected to carry on during the 32nd year include: T. Trombour, M. Glover, A. P. Munning, Dr. Beckwith, A. Braun, R. Ledford, H. Struckhoff, G. Stutz, H. Nice, W. D. MacDermid, J. Duffy.

The MFSA sponsored the International Fellowship Club Open House at the Hotel Carter Monday evening and the golf tourney on Tuesday. (See picture of Board of Directors in July issue of PLATING.)

NAMF

At a very important meeting attended by all the notables and officers of both the old NAMF and MEPA a reorganization and a merger took place which resulted in a new, larger and probably more effective organization which retained the name of NAMF. (See story in Intersociety News.)

MFSA Secretary, A. P. Munning reports at the brunch-meeting

NFMF

This organization ceased to exist when it merged itself with the new NAMF (the old NAMF followed suit and it was decided to call the new organization the National Association of Metal Finishers).

MBFA

The Midwest Barrel Finishing Association had a very successful meeting where mutual business and technical problems in the barrel finishing and tumbling fields were discussed. The meeting was presided over by President Stanley I. Busch with eastern distributors of barrel finishing equipment in attendance.

Order of Past Presidents

The Order of Past Presidents met at a dinner which was attended by the men listed above (final business session) and many of their wives. The occasion was both impressive and happy (see photo).

Ladies' Program

The ladies' committee with Mrs. Frances Hoffman as capable chairman arranged a full and exciting program. As has been the custom, this phase of the convention will be reported by one of the ladies in the September issue of PLATING.

Dave Clarin, at the Aunt Ella party, hands out the first prize

Torres, McDonald, a friend and Raimundo Solis of Mexico City

MBFA meeting. Seated l. to r.: F. Jones, R. May, P. Kirchartz, S. Imrischals, H. Armstrong, L. Duncan, D. Jones, P. Rees, P. Hampton. Standing, l. to r.: S. Prater, C. Brandon, R. Owen, C. Wise, R. Weber, and S. Busch

Before the opening of new facilities at Painesville, Ohio (top photo) . . .

New Chromic Acid Plant Brings Faster Service, Lower Freight Rates to Mid-West Platers

. . . DIAMOND produced all its chromic acid at Kearny, N.J. (bottom photo). Now, DIAMOND has two completely integrated plants.

With the addition of a basic chromic acid installation at Painesville—first in the mid-west—DIAMOND now offers platers outstanding service, faster deliveries, lower freight costs.

DIAMOND facilities—two chromic acid plants and nine warehouse points and sales offices across the country—assure you uninterrupted supply. DIAMOND ALKALI COMPANY, 300 Union Commerce Building, Cleveland 14, Ohio.

DIAMOND ALKALI CHEMICALS

DIAMOND CHROMIC ACID

Intersociety News

Morisset

Rousselot

"Chrome Dur" Has Its Annual Conference

The annual conference of the "Centre d'Information du Chrome Dur" took place on May 13 at the Maison de la Chimie with Pierre Salmon presiding. Five papers were presented by Rousselot, ICXL Darmon, Noviant and Morisset.

Robert Rousselot of the Electroplating Laboratory of the National Center of Scientific Research presented a paper on the covering power of chrome baths. He investigated the influence of five variables: concentration of CrO_3, percentages of H_2SO_4, percentages of Cr_2O_3 and iron, temperature, current densities.

Paul Morisset treated with the influence of the structure and thickness of electrodeposited chrome for corrosion protection. Morisset is a graduate of L'Ecole Polytechnique and is the Director of the "Centre d'Information du Chrome Dur."

ASTM Committee D-19 on Industrial Water Continues Intensive Activity

Significant progress was made on plans for a second edition of the Manual on Industrial Water. The first edition has been very well received. Most of the present chapters will be extensively revised and others will be added, including material to cover the increasingly important field of industrial waste water. An outline of the material for the new edition has been substantially completed and preparation of the material for a new edition is now under way. It is expected that the second edition will be ready for publication in 1956.

Action was taken to recommend for adoption as standard the Methods for Examination of Water-Formed Deposits by Chemical Microscopy (D 1245); for Iodide and Bromide Ions in Industrial Water (D 1246), and for Reporting Results of Analysis of Industrial Water (D 596).

Revisions of fourteen standards and tentatives relating to industrial water and industrial waste water were approved for committee letter ballot.

The Committee recommended publication, for information only, of a comprehensive set of tests for optical properties of industrial water covering all important current instrumentation and techniques in this field.

Task groups were established to work on methods of tests for acidity and alkalinity and for phosphates in water supplies for use in the evaporative industry. It is intended that these methods, when approved by Committee D-19, will be submitted to the American Society of Mechanical Engineers for inclusion in the section on the Care of Power Boilers, of the ASME Boiler Test Code.

Of considerable interest to all concerned with the analysis of water-formed deposits will be the comprehensive scheme for analysis of such deposits which has been nearly completed for publication, agreement having been reached on all major points as a result of extensive cooperative tests reported on at the meeting.

A new subcommittee was set up to be responsible for all methods for physical or chemical testing of water or water-formed deposits wherein the specialized nature of the apparatus required is the controlling factor.

Development has also been started on procedures intended specifically for the determination of the following in industrial waste water: chromium compounds, specific gravity, oily matter by infrared and chromatographic techniques, mercaptans, residual chlorine, viscosity of sludges or slurries, and rate of separation of material that will settle or rise.

ASTM AWARDS

Partridge Wins Second Max Hecht Award

Everett P. Partridge, Director, Hall Laboratories, Inc., Pittsburgh, was honored during the 58th Annual Meeting of the American Society for Testing Materials at Atlantic City by receiving the second Max Hecht Award. This Award was established in 1954 by Committee D-19 on Industrial Water in honor of its first chairman and is given in recognition of outstanding service to the committee in the advancement of its objective—the study of water as an engineering material.

Sanford E. Thompson Award—To Richard C. Mielenz, Head, Petrographic Laboratory, U. S. Bureau of Reclamation, Denver, for his paper "Petrographic Examination of Concrete Aggregates." This is the third time Dr. Mielenz has won the award, having received it previously jointly with L. P. Witte in 1949 and with L. P. Witte and O. J. Glantz in 1951. The award was established in 1938 by ASTM Committee C-9 on Concrete and Concrete Aggregates to be given to the author or authors of a paper of outstanding merit on concrete and concrete aggregates presented at a meeting of the Society. The award is named in honor of the committee's first chairman who served from 1914 to 1922.

C. A. Hogentogler Award—The second award to Harold G. Mason and John A. Bishop, U. S. Naval Civil Engineering Research and Evaluation Laboratory, Port Hueneme, Calif., and Philip P. Brown and L. A. Palmer of the Bureau of Yards and Docks, Dept. of the Navy, Washington, D. C. for their paper "Piles Subjected to Lateral Thrust." Mason and Bishop received the award for Part I of the paper on "Measurement of Earth Pressure and Deflection Along the Embedded Portion of a 40-ft. Steel Pile;" and Brown and Palmer for Part II on "Analysis of Pressure Deflection, Moment, and Shear by the Method of Difference Equations." This award was established in 1954 by ASTM Committee D-18 on Soils for Engineering Purposes in honor of its first chairman and is given in recognition of a paper of outstanding merit on soils for engineering purposes presented before the Society.

—Plating Staff Photo

New ASTM President, Claire H. Fellows, Detroit, Michigan (center) chats with Clarence H. Sample (left) of INCO and AES member on ASTM B-8 and Frank L. LaQue of INCO

Cornell Society of Engineers Elect

The Cornell Society of Engineers, at their Annual Meeting, elected the following: President, William M. Leonard, M.E. '24, Consolidated Edison Company; Executive Vice-President, Walter L. Hardy, Chem.E. '38, Foster D. Snell, Inc.; Secretary-Treasurer, Daniel M. Lazar, C.E. '29, Cayuga Construction Company; and Recording Secretary, Richard W. Eustis, Chem.E. '43, Esso Standard Oil Company.

During the past year the Cornell Society of Engineers have engaged in the preparation and publication of a Directory of all Cornell Engineering Graduates. This is the first such Directory which has ever been published.

Committee Appointed for TAPPI National Plastics Meeting

J. C. Pullman of American Cyanamid Company and Chairman of the TAPPI

Intersociety News

Plastics Committee announces the appointment of the Committee for the TAPPI National Plastics Meeting. This meeting, on the general theme of "Fibres and Plastics for Laminates" will be held in Brooklyn, New York, on November 14 and 15, 1955.

The members of the National Plastics Meeting Committee are: H. F. Mark, Polytechnic Institute of Brooklyn, General Chairman; W. L. Hardy, Foster D. Snell, Inc., Technical Program Chairman; and R. Lindenfelser, American Cyanamid Company, Local Arrangements Chairman. Mr. Pullman and V. C. Stannet, of the New York State College of Forestry, Chairman and Secretary, respectively, of the Plastics Committee of TAPPI are also members of the National Meetings Committee.

John Forbath, MEPA Plating Man of the Year

On May 7, at the 37th Annual Banquet of the Masters' Electro-Plating Association, John J. Forbath of Star Chromium Corp. received the Plating Man of the Year Award. On behalf of the Association, Frank Kaiser presented John with a bronze plaque inscribed as follows: "To Honor John J. Forbath for his devoted services and untiring efforts to promote good will and sound business practice towards the advancement of MEPA and Metal Finishing Industry. Presented with esteem and affection by the Masters' Electro-Plating Association, 1955." Mrs. Forbath also received a gorgeous bouquet of roses.

L. to r.: Mrs. J. J. Forbath, Al D'Agostino, MEPA pres., J. J. Forbath, award recipient, Frank Kaiser who presented award

Plating Staff Photo

John Forbath has been very active in Association affairs for over twenty years. He served as Chairman of the Executive Committee in 1938 and in 1939. Altogether he has served on the Executive Committee of the Association for at least fifteen years.

John received mechanical and electrical engineering degrees from the University of Budapest in 1918. In the early days of his career he worked as a consultant for the Electric Bond and Share Co. and for the New York Central R. R. Co.

In 1932 he entered the plating field as

avoid costly rejects due to unacceptable coating thickness...

For quality control and acceptance tests, measure thickness of coatings on metals the easy, accurate, non-destructive way, with the . . .

AMINCO BRENNER MAGNE-GAGE

Widely used by industry and government for accurately measuring the thickness of:

1. Non-magnetic coatings (metallic or non-metallic) on magnetic base metals.
2. Nickel coatings on magnetic or non-magnetic base metals.

Measures coatings on plane, convex or concave surfaces. Gives speedy and accurate results. Easy to use by non-technical personnel.

Avoids expensive rejections due to coatings that may be too thin, or non-uniform. Eliminates the expense involved in replating or discarding specimens spoiled by destructive tests . . . every piece tested is unharmed and ready for use or shipment. Saves materials wasted by coatings thicker than necessary. Its use leads to the discovery of faults that may exist in plating methods or equipment.

Write for Bulletin 2253- F

Coating on cylindrical object being measured with Magne-Gage

AMINCO Laboratory Instruments

AMERICAN INSTRUMENT COMPANY, INC.

Silver Spring, Maryland • In Metropolitan Washington, D. C.

Intersociety News

Manager for the Grand Chromium Corp. then situated in Long Island City. He remained with Grand Chromium until 1941 with a successful record of achievement. In 1941 he became a partner in Star Chromium Corp. also in Long Island City. The firm grew from an establishment of 5,000 square feet to the present where it occupies about 20,000 square feet of space at 43-19 37 Street, also in Long Island City. In 1951 John bought out his partner and is now sole owner of the organization.

NAMF Reorganizes; Elects New Officers

Announcement has been made by John Palik, Jr., National Plating Corp., Cleveland, of the election of officers and directors of the newly reorganized National Association of Metal Finishers. The association of job-shop owners and operators is the result of the merger of the National Federation of Metal Finishers and the previous association, the name of which it retains.

Elected to the Board of Directors of the new group were Robert L. Giesel, Adolph Plating, Inc., Chicago; J. Robert Greenwell, Reliable Plating Corp., Chicago; David J. Griffin, Birmingham Plating Works, Birmingham, Ala.; Lawrence J. Hay, Plating Service Co., Chicago; Frank Kaiser, Long Island Mechanical Plating Co., Woodside, L. I., N. Y.; Webb B. Knight, Knight Plating Co., Detroit; Paul E. Miller, Miller Plating, Inc., Evansville, Ind.; E. J. Musick, Musick Plating, Inc., St. Louis, Mo.; Julian Nelkin, Henry Nelkin, Inc., New York; Sal Novelli, Service Plating Co., Brooklyn, N. Y.; John Palik, Jr., National Plating Corp., Cleveland; Arthur G. Pierdon, Art Metal Finishing Co., Washington, D. C.; and William F. Walton, Walton & Lonsbury, Attleboro, Mass.

Officers of the new group are: John Palik, Jr., President; L. J. Hay, FirstVice-President; Paul Miller, Second Vice-President; Frank Kaiser, Secretary-Treasurer; and Sal Novelli, Assistant Secretary-Treasurer.

ASTM's Officers 1955-56

ASTM President (Term: One Year)—Claire H. Fellows.

Claire H. Fellows has been Director of the Engineering Laboratory and Research Dept. of the Detroit Edison Co. since 1952. A native of Kalamazoo, Michigan, Fellows was graduated from Purdue University with a B.S. in Chemical Engineering and has been associated with the Detroit Edison Co. since 1919. He headed the Chemical Division of the Research Dept. from 1925 until 1951 when he was appointed Acting Head of the Department. Fellows has been a pioneer in the study of water treatment and corrosion problems in steam generating plants and undertook some of the first industrial studies of the reaction of steel and steam at high temperatures and pressures as applied to steam generation in modern boilers. He is the author of many papers and reports in this field.

He has been a member of ASTM since 1931, has served as Director for two separate terms and has been Vice-President since 1953. He is active in the work of technical committees D-9 on Electrical Insulating Materials, D-19 on Industrial Water, D-2 on Petroleum Products and Lubricants, and A-5 on Corrosion of Iron and Steel. He has been active in the work of the ASTM Detroit District Council for many years, having served as chairman, and has been chairman of the Society's Administrative Committee on District Activities. He has served as chairman of the Joint Research Committee on Boiler Feedwater Studies and currently is the ASTM representative on its executive committee.

In addition to ASTM, Fellows is a member of the ACS, NACE, American Water Works Association, American Association for the Advancement of Science, and the Engineering Society of Detroit.

ACID-ALKALI-PROOF CONSTRUCTION

CHEMSTEEL CONSTRUCTION COMPANY, INC.

SEND FOR FREE DATA ON
ACID-ALKALI-PROOF CONSTRUCTION
And see how Chemsteel's experience in the steel, chemical, textile and food industries can solve your corrosion problem economically, quickly, and correctly!

393 Chemsteel Bldg., Walnut St., Pittsburgh 22, Pa.

USE READER SERVICE CARD; INDICATE A 860.

FOR SALE

Slightly Used BUFFS

Loose and Sewed
Air-Cooled

Any Quantity

MICHIGAN BUFF CO., INC.

3503 GAYLORD AVE. DETROIT (12), MICHIGAN

PYROSIL...outstanding manufacturer of

QUARTZ PIPE

"FUSED SILICA"
FOR ALL PURPOSES

welding ring inserts • chemical plants • high temperature furnaces • refineries dryers • heat exchangers

ANY SIZE OR ORDER FOR YOUR SPECIAL NEEDS AND APPLICATIONS

QUARTZ ELECTRIC IMMERSION HEATER for every application

*FAR-INFRARED RADIANT HEAT LAMPS

Uniform infrared heat for baking, drying, curing or dehydrating process.

*Duo-style reflectors

PYROSIL INC.

CUYAHOGA FALLS, OHIO

USE READER SERVICE CARD; INDICATE A 862.

Intersociety News

ASTM Vice-President (Term: Two Years)—R. T. Kropf.

Richard T. Kropf has been Vice-President and Director of Research for the Industrial Thread Division, Belding Heminway Co., Inc., since 1949.

Kropf has been a member of ASTM since 1944 and has been active on Committee D-13 on Textile Materials, currently serving as First Vice-Chairman and Chairman of Subcommittee C-2 on Papers. He is also a member of the Advisory Subcommittee and other working groups.

In addition to ASTM, Kropf is a member of the ACS, American Physical Society, Treasurer of the Fiber Society, (Past President) New York Academy of Science, Textile Research Institute, American Association of Textile Technologists, Technical Industrial Intelligence Committee, and has been Scientific Consultant to Quartermaster General.

ASTM Director (Term: Three Years)—E. F. Lundeen.

E. F. Lundeen is Assistant Superintendent of the Quality Control Department of the Inland Steel Co., Chicago, Ill., and has been employed by the Inland Steel Co. for the past 14 years.

ASTM Director (Term: Three Years)—F. L. LaQue.

F. L. LaQue has been a Vice-President of the International Nickel Co., Inc., and Manager of its Development and Research Division since June 1954. He had previously been head of the Corrosion Engineering Section of that Division since 1945.

ASTM Director (Term: Three Years)—A. Allan Bates.

A. Allan Bates has been Vice-President for Research and Development of the Portland Cement Association, Chicago, since 1946. He joined the PCA organization after eight years as manager of Chemical and Metallurgical Research at Westinghouse Electric Corp.

ASTM Director (Term: Three Years)—John C. Moore.

John C. Moore has been Technical Director of the National Paint, Varnish and Lacquer Association for one year and was Director of the Scientific Section of that Association for about seven years. He was formerly Superintendent of the Sinclair Refining Co. paint plant for thirteen years.

ASTM Director (Term: Three Years)—Richard C. Alden.

Richard C. Alden has been with the Research Department of the Phillips Petroleum Co. since 1925, shortly after it was organized. He became Assistant Director in 1930, Director of Research in 1933, and Chairman of the Research Planning Board in 1950. With Phillips he has played an active part in that company's pioneering developments in such important fields as liquefied petroleum gas, aviation gasoline, synthetic rubber, motor fuel, lubricants, light hydrocarbons, petrochemicals, and natural gasoline.

Hunter and Fricke Receive Templin Award

M. Scott Hunter and William G. Fricke, Jr., Aluminum Research Laboratories, Aluminum Company of America, New Kensington, Pa., were honored during the 58th Annual Meeting of the American Society for Testing Materials in Atlantic City by receiving the Richard L. Templin Award for their paper, "The Metallographic Aspects of Fatigue Behavior," describing new and useful test methods and apparatus.

The KOCOUR SULFATE TEST SET with ELECTRIC CENTRIFUGE

. . . determines sulfate content in a chromium plating bath . . . directions are easy to follow . . . no calculations necessary . . . readings are directly in ounces per gallon.

● KOCOUR are specialists and pioneers in testing equipment for controlling plating — cleaning — pickling — anodizing — and hardening processes . . . special sets can be provided for your requirements.

Write today for further information—no cost or obligation.

KOCOUR COMPANY
4801 S. ST. LOUIS AVENUE
CHICAGO 32, ILLINOIS

Specify KOCOUR test sets from your supplier.

USE READER SERVICE CARD; INDICATE A 863.

McKeon's Zinc-Brite

Top-quality, low-cost

ZINC SOLUTION PURIFIER

Eliminates heavy metal impurities, including copper.

Prevents harmful build-up of carbonates.

A complete cleansing treatment:—No other purification measures necessary.

Write-Phone-Wire Collect

Sulphur Products Co. Inc.
228 McKeon Way
Greensburg, Pa.

USE READER SERVICE CARD; INDICATE A 864.

AES News

President Kelly Announces New Committee Appointments

Clyde Kelly, who took office in June at Cleveland, has announced more than twenty-five committee appointments. They are:

AES Representative to ASTM: **P. Kovatis, Executive Secretary, AES.**

AES Representative on ASTM B-8: **R. F. Ledford, Industrial Filter & Pump Company, Chicago, Ill.**

AES Research Committee Representative from ASTM B-8: **C. Sample, International Nickel Company, New York.**

AES Representative on ASTM D-19: **G. E. Best, Mutual Chemical Division, Allied Chemical and Dye Corp., Baltimore, Md.**

AES Representative on ASA Committee (Proposal Project on Fundamentals of Performance of Effluent Air and Gas Cleaning Equipment): **G. Schore, Peerless Electric, New York, N. Y.**

AES Representatives on ASA Committee Z-9, "Sectional Committee on Safety Code for Exhaust Systems": **E. R. Bowerman, Jr., Sylvania Electric Products, Long Island, N. Y., Chairman; M. B. Diggin, Alternate, Hanson-Van Winkle-Munning Company, Matawan, N. J.**

AES Credentials Committee: **Past President George P. Swift, Chairman, Watertown, Mass.**

AES Paper Awards Committee: **Earl Arnold, The L. M. Butcher Company, Los Angeles, Calif., Chairman; Ed. Wallin, Stromberg-Carlson, Rochester, N. Y.; Stanley Beyer, General Electric Company, Louisville, Ky.**

AES Committee on Broadening of the Society Base: **Leonard Weeg, National Lock Company, Rockford, Ill., Chairman.**

AES Representatives to the International Council for Electrodeposition: **Dr. W. R. Meyer, Chairman, Enthone, Inc., New Haven, Conn.; W. L. Pinner, Alternate, Houdaille-Hershey Company, Detroit, Mich.**

AES Publications Committee: **Dr. Richard B. Saltonstall, Chairman, The Udylite Corp., Detroit, Mich.**

AES Representative on Ohio River Valley Water Sanitation Commission: **Past President William J. Neill, Columbus Metal Products, Inc., Columbus, Ohio.**

AES Law Committee: **George W. Cavanaugh, Chairman, General Electric Company, Syracuse, N. Y.; Eugene Roth, Roth Plating, South Bend, Ind.; I. Wm. Marcovitch, American Machine & Metals, U. S. Gauge Division, Sellersville, Pa.**

AES Liaison Committee to the NACE (ISCC): **Dr. Richard M. Wick, Chairman, Bethlehem Steel, Bethlehem, Pa.; Dr. Russell E. Harr, Alternate, Western Electric Company, Chicago, Ill.**

Bruce Warner, liaison representative to NAMF, **New England Plating Co., Worcester, Mass.**

AES Representatives to the National Task Committee on Industrial Wastes: **Dr. C. F. Gurnham, Chairman, Michigan State College, East Lansing, Mich.; Dr. D. G. Foulke, Alternate, Hanson-Van Winkle-Munning Company, Matawan, N. J.**

Constitutional and By-Laws Revision Committee: **Past President George P. Swift, Chairman, Watertown, Mass.; S. Krentel (Los Angeles Branch); L. Sperry (Grand Rapids Branch).**

All appointments are for the year 1955–1956.

NEW APPOINTEES

Kovatis

Ledford

Best

Sample

Schore

Swift

Arnold

Gurnham

Meyer

Bowerman

Neill

Saltonstall

Weeg

Wick

(Cut of G. W. Cavanaugh was not available — Ed.)

"pH at your fingertips..."

...nothing like it!

This revolutionary ANALYTICAL pH PROBE UNIT makes possible on-the-spot pH readings anywhere. No more trips to the laboratory, no supports, beakers holders or separate electrodes.

This PROBE UNIT has made possible a true pocket sized pH METER that simplifies pH determination and eliminates errors due to sampling techniques, turbidity, and presence of oxidizing or reducing agents.

No indicating solutions, measurement of sample or color matching are necessary.

Completely self-contained in water-proof ever-ready case with shoulder strap.

PRICE $125.00

Instrument size: 3x5-7/8 x 2-1/2 inches
Case size: 3-3/4 x 6-1/2 x 4-1/8 inches
Weight with accessories: 3 lbs.

Analytical Measurements, Inc.

3187

ANALYTICAL MEASUREMENTS, INC.
585 Main St., Chatham, N. J.

Please Send Full Information To:

Name.....

Company.....

Street.....

City.....Zone.....State.....

1056 INDICATE A 865

AES News

Kelly

AES, MFSA, NAMF Plan to Alleviate Nickel Shortage

Three prominent organizations of the metal finishing and electroplating industry, spearheaded by the American Electroplaters' Society, have formed a joint committee in an attempt to alleviate the nickel shortage in the U. S. today.

According to Clyde Kelly, president of the American Electroplaters' Society, "The American Electroplaters' Society represents all phases of plating and is aware of its responsibility to protect the interests of its members. The shortage of nickel for plating purposes is a matter of great concern to the Society and we shall do all in our power to find ways and means of alleviating this shortage, including the possibility of a 'good housekeeping' program aimed at conservation of nickel at the shop level."

Although the formation of the joint committee has not been completed, principal executive officers have already made important initial steps. This committee to date comprises Clyde Kelly, AES president; Herman Struckhoff, president, Metal Finishers' Suppliers Association; and John Palik, Jr., president, National Association of Metal Finishers.

The AES, MFSA and NAMF represent more than 8,000 plating and finishing shops in the U. S. and have a combined membership of close to 16,000.

Dr. Muraca Leaves Lehigh University

Dr. Ralph F. Muraca has resigned as Assistant to Dr. Serfass in the Chemistry Department at Lehigh University to accept a position with California Institute of Technology.

Dr. Muraca is a well-known author who has contributed extensively to PLATING magazine in the past. His work has been mostly in research in connection with ORSANCO. In fact, Dr. Muraca was the recipient of the coveted Carl E. Heussner Award presented to him at the 42nd Annual AES Convention.

As of August 1, Dr. Muraca is to leave Lehigh to fill the position of Group Leader, Analytical Chemistry Department, Jet Propulsion Laboratories, Pasadena, California (a division of Cal. Tech.).

Dr. Muraca was born July 27, 1921 in Easton, Pa. He attended Easton Senior High School. In 1943 he received his B.S. degree from Lehigh University in Chemistry. In 1947 he earned his M.S. degree, and in 1950 his Ph.D. from the same university. He is a member of Sigma Xi. In addition to being a member of the Exchange Club and the PTA, he serves on the Board of Control of the former and is President of the latter. He is a member of ACS, American Association for the Advancement of Science, American Association of University Professors, and has been an active member of the Allentown-Reading Branch, AES since 1951.

We are sure his many friends in the AES wish him the best of luck.

NEWARK MAN RECEIVES NATIONAL HONORS

Plating Staff Photo

George Wagner being presented the Certificate of Honorary Membership

George Wagner, president of Hy-Grade Electro Plating Company, 35 4th Street, Newark, N. J., was awarded the National Honorary Member's Award of the American Electroplaters' Society.

This coveted honor was bestowed on Wagner at the final session of the 42nd Annual Convention of the AES in Cleveland for "outstanding contributions to the American Electroplaters' Society." He joins a mere handful of AES members who have received this honor in the 46-year-history of the Society.

A member of the Society for more than 25 years, Wagner has held most all offices of the local Newark branch and has gone through the many Society boards and committees. He served as National President in 1944. Just recently he relinquished the Newark branch secretary-treasurer's duties after 20 years of service.

Wagner is also active in local community and civic groups.

AES News

DR. EARL SERFASS RECEIVES AWARD OF MERIT

As an expression of the deep appreciation the Society feels for the contributions made by Dr. Serfass, he was presented with the Award of Merit at the 42nd Annual Convention in Cleveland. Dr. Serfass' service as Chairman of the Research Board for two years ('53–'54 and '54–'55) was marked by accomplishment which made that body one of the most effective in the Society. In addition, many articles on ORSANCO carried the by-line of Dr. Serfass and the liaison he effected between the AES and ORSANCO is not to be discounted.

Dr. Serfass receiving award

Finally, the "Process Control Handbook" is still his "baby" and remains the end-point of long and devoted work.

Dr. Earl J. Serfass, a recognized authority in the fields of chemistry, electrochemistry and metallurgy, is chairman of the chemistry department at Lehigh University in Bethlehem, Pa.

Classified Advertisements

Only "Help Wanted" and "Situations Wanted" will be accepted. Rates: $.20 per word, minimum $5.00. AES branch members and members-at large, in good standing, are entitled to a total of three *free* advertisements in one year. Last day for inserting advertisements is the 10th of month preceding date of publication. When answering advertisements please address as follows: Box number, PLATING, 445 Broad Street, Newark 2, N. J.

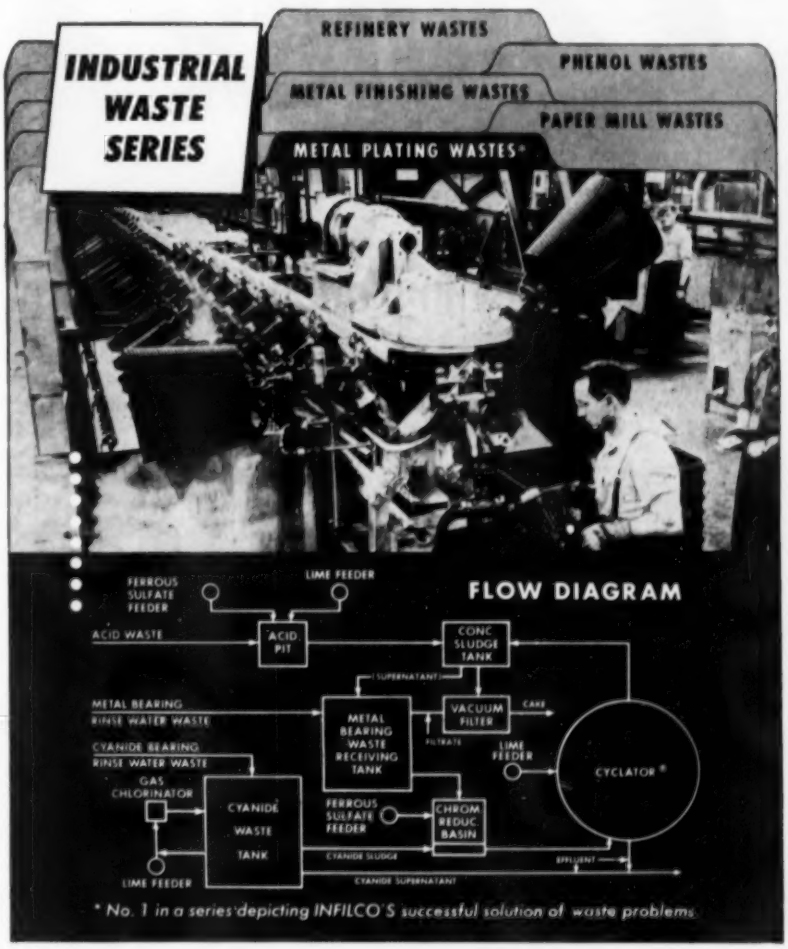
POSITION WANTED—Plating - polishing foreman, age 43, with 15 years practical experience in metal working industry; 8 years as supervisor of plating and finishing department. Seeking position as foreman or assistant foreman with opportunity for advancement in plating or allied industry. Waterbury, New Haven or Derby, Conn., area. Reply to Box A1, PLATING, 445 Broad St., Newark 2, N. J.

SALES REPRESENTATIVE—Wanted a salesman thoroughly acquainted with plating industry, to sell Copper Core Chrome Plating Anodes. Excellent opportunity with one of country's leading manufacturers. Additional nonconflicting lines may be carried. Liberal compensation plan. Reply to The Gilbert Tramer Co., 1217 Main Ave., Cleveland 13, Ohio.

WANTED—Foreman, hard chrome. Philadelphia area, permanent job and good opportunity. Give details in first letter: schooling, work history, salary desired. Reply to Box A2, PLATING, 445 Broad St., Newark 2, N. J.

SITUATION WANTED—Metal finishing supervisor available, with extensive background in production, industrial management, and technical control. Thoroughly experienced in all phases of electroplating and non-electrolytic processes on ferrous and non-ferrous materials. Will assume full responsibility of job shop or industrial metal finishing department. Reply to Box A3, PLATING, 445 Broad St., Newark 2, N. J.

WANTED—Polishing and plating foreman to supervise 6 experienced polishers and train new ones—good pay and working conditions—growing company Cleveland area. Reply to Box A4, PLATING, 445 Broad St., Newark 2, N. J.



There is no "cure all" for solving waste treatment problems.

FOR EXAMPLE: our thorough evaluation of your problem could dictate the utilization of ion exchange rather than the precipitation equipment found most practical in the existing plating waste installation diagrammed above.

We invite your specific inquiries and know that our wide experience in all phases of waste treatment will prove helpful to you. Request Bulletin 70-H

INFILCO INC.

933 South Campbell Ave.
Tucson, Arizona
Plants in Chicago and Joliet, Illinois
FIELD OFFICES IN PRINCIPAL CITIES IN AMERICA

cadmax

zimax

New efficiency in plating brighteners

Cadmium and zinc plating need not be dull and frosty. With Cadmax and Zimax, new brighteners distributed exclusively by Federated, cadmium and zinc plated parts are glossy and smooth.

These new Federated brighteners provide maximum throwing power, maximum coverage, maximum allowable current density, maximum brilliance and maximum luster. Zimax brighteners are available in both liquid and powder forms; Cadmax is available in liquid form only.

Ask your nearest Federated distributor to show you what Cadmax and Zimax will do. Or fill in the coupon below and we'll have a Federated sales engineer call on you from the nearest of our 13 plants and 23 sales offices.

Federated Metals

DIVISION OF AMERICAN SMELTING AND REFINING COMPANY
120 BROADWAY, NEW YORK 5, N. Y.
In Canada: Federated Metals Canada, Ltd., Toronto and Montreal

Aluminum, Magnesium, Babbitts, Brass, Bronze, Anodes, Zinc Dust, Die Casting Metals, Lead and Lead Products, Solders, Type Metals

Federated first in the non ferrous field — FMD

I want to know more about Cadmax and Zimax, your new cadmium and zinc plating brighteners. Please have a salesman call on me.

Name..... Title.....

Company.....

Street.....

City..... Zone..... State.....

Mount Holly's Pride

THE BEAUTIFUL RANCOCAS

The photograph of Rancocas Creek, taken by Eskel Nordell,* author of "Water Treatment for Industrial and Other Uses," near the Permutit greensand mine and processing plant at Birmingham, N. J. The Rancocas is not only well known to canoeists as a picturesque stream to explore but it is also renowned as a clear swamp water —brown in color but clear as crystal except for short periods of turbidity following heavy rains.

Formerly this cedar swamp water was greatly esteemed not only by the neighboring inhabitants but also by the masters of the old sailing ships because it kept so well during long voyages. So whenever their ships came near where it enters the Delaware, boats would be sent up the Rancocas and the water casks would be filled with this highly prized "cedar swamp water." Historic Mount Holly, N. J. used to obtain all of its water from the Rancocas and bitter indeed were the complaints of the citizens when the water company switched from the Rancocas to a well supply which was not only colorless but, according to these irate householders, was also tasteless.

In bygone years, the Rancocas, at Mount Holly, was spanned by a section of the only railroad of its type in the world—a monorail bicycle railroad. It was built by that eccentric genius Smith to connect his bicycle factory and the surrounding town of Smithville which, with due modesty, he had named after himself, with Mount Holly.

While the Rancocas water is used in the Permutit plant at Birmingham, N. J. Permutit does not esteem the color or taste of the water but instead, removes them. This is accomplished in a coagulation, chlorination and filtration plant with a capacity of 2,000,000 gpd. Coagulation is effected with alum and soda ash. A little clay is also added to secure a quick settling floc and the water is also chlorinated. It is then settled and filtered through pressure filters before use so that its only resemblance to the raw river water is in that they both are wet.

*Eskel Nordell is "Director of Technical Information." The Permutit Company.

Branch News

LOS ANGELES

Membership Contest Launched at Final Meeting

The final meeting of the Los Angeles branch for the summer was held on June 8 at the Rodger Young Auditorium. It was very gratifying to the officers to see such a large turnout. We had 94 present at this particular meeting, 80 of these being members.

A membership contest was announced by the Membership Chairman, **Truman Stoner,** which will run from September through March. A first prize of a $50.00 gift certificate and a second prize of a $25.00 one will be given to the member writing up the most applicants. Every member of the branch is eligible except those whose name appears on the official stationery of the branch. He also introduced 6 new candidates for membership in the branch and they will be installed in September. President **Earl Arnold** installed the following men as new members:

Ralph Humphreys, North American Aviation; **Donald D. Steel,** California Metal Processing Co.; **Clare P. Ver West,** Mefford Chemical Co.; and **Rudolf Mastaler,** Master Plating Co., Phoenix.

The speaker of the evening, **Joe Byouk** of the General Chemical Co., presented a very interesting paper on "New Developments in Fluoborate Solutions." A lively discussion period followed and the meeting adjourned at 10:00 P.M.

Don Bedwell was welcomed back by the branch after a month in Hawaii.

G. J. Hetz,
Secretary

MELBOURNE

Dr. Moore Talks on Polishing

After a showing of films, the meeting opened with 40 members and visitors present. Nine applications for membership were reported on favorably by the board of managers and the following were elected: **J. P. Luttick, M. G. Sheppard, J. K. Avery, E. C. McNamara, A. F. Fry, R. E. Gannon, W. Rogers, F. P. McManamny** and **H. F. Chamberlain.**

The technical program began with **J. J. Dale** introducing **D. A. W. Moore** of the C.S.I.R.O. Division of Tribophysics and after Dr. Moore's lecture on "Modern Ideas on Polishing" there was an interesting discussion with several fine distinctions being brought out, notably those between atomic and molecular adhesion and between polishing to platers standards and to metallurgical standards.

NEWARK

Austin on Silent Salesmen; Sample on ASTM Committees

The meeting opened with a film on automatic vending machines after which President **Austin** called the business meeting to order. **Charles Smith** and **A. A. Nortof** of Hanson-Van Winkle-Munning and **William Ross** of Bart-Messing were elected to membership, and the application of **Robert F. Fowler** of Bart Manufacturing Co. was accepted.

Dr. Dodd Carr reported a favorable response to the proposed Electroplating Course.

Resignations were accepted from **Noyes, Mullin** and **Kuell.**

The meeting was then turned over to Librarian **William Grigat** who recalled **Tom Austin** to the platform to discuss the Silent Salesman. He described the present use of vending machines, some 3,000,000, as beginning many years ago with the dispensing of Holy Water and later tobacco. The broad application of this method of retailing was discussed and Austin concluded by reviewing the plating specifications followed by the manufacturers of such equipment.

Sample of the International Nickel Company then discussed the work of Committee B-8 of the ASTM. He outlined the beginnings of this activity and pointed out the cooperation existing through the years between ASTM and AES. Presently B-8 covers all electrodeposited coatings and all base metals, limited only to joint control of specifications relating to methods of testing with Committee A-5.

The five subcommittees—specifications, performance tests, conformance tests, electroplating practices and supplementary finishes were discussed.

Nine specifications, seven (three more being drafted) recommended practices have been released and many exposure tests have been made.

The general interest of the group in this activity and AES-ASTM cooperation was evidenced by the many questions asked.

D. Gardner Foulke,
Secretary

PORTLAND

A Film, A Discussion, Adjournment

The June meeting was held at Berg's Chalet on Tuesday, June 7, and was called to order by President **Harold Burkitt.** There was a good representative turnout of the local plating industries; and, for the evening's entertainment, they showed the film entitled Industrial Album, as put out by the Frederick B. Stevens Company in Detroit. This covered the various phases of barrel plating and metals handling. After the film a brief discussion followed and the meeting adjourned at 9:30.

Ken Humphrey,
Secretary-Treasurer

A recent meeting, attended by Clyde Kelly, of a group which is working toward Branch recognition yielded this photo. The group may be known as the Quad-City Branch according to Lloyd Gilbert. Front Row (L. to R.): Donald H. Sale, Jacob Knanishu, John Hartman, Russell H. Wolff, Lloyd O. Gilbert, Clyde Kelly, Glen Stoebe, John Miller, John Stoneking, Sr., Robert Stoneking, Jr., Earl McCullough, Russell Shelton, Vern Kron. Second Row (L. R.): George Rial, P. James Rich, Herbert Harvey, Dewey Carroll, Bernard Nordbloom, Carl Dunk, L. J. Ketelsen, Ervin Schnittgrund, Donald E. Hintz, Harlan H. Erps, John Smith, Donald R. Johnson. Third Row (L. R.): Paul Chamberlain, Sterlin Feeney, Fred Brown, Alvin F. Hansen, Frank Bryant, Jodie Doss, Richard Rose, James Folle, R. B. Eyre

AES Membership Report

Elections

ADELAIDE: Ross K. Smith, Kenneth L. Thompson

ALLENTOWN-READING: William P. Maslo, Joseph W. Ross, Martin Frey

BALTIMORE-WASHINGTON: Jean Bauer, Joseph Eisenberg, Gerald L. Greenstreet, William E. Hock, Louis N. Markwood, George L. McDowell, Richard J. Norris

CAPITOL DISTRICT: Thomas A. Barile, Frank W. Hammond, Jr.

CHICAGO: Paul A. Cramer, Sheridan Demain, Bernard L. Downey, Casey P. Grikenis, Marvin Klein, Steve A. Rogus

CLEVELAND: Theodore E. Betz, Charles R. Curtin, Jr., Eugene G. Huth, James S. Krejci

DETROIT: Joseph L. Anderson, Jr., John F. Breen, Roy J. Firestone, T. King Gates, Richard S. Keen, Henry G. Leeds, John S. Mac Nairn, Frank L. Runson, Tyrus R. Smith

GRAND RAPIDS: Livingston E. Cole

KANSAS CITY: William B. Harding

LANCASTER: Gerald Beck, George Cockley, Donald Graybill, George P. Haefner, Norwood G. Lefever, George C. Lefevre, Charles A. McConnell, Harry Reese, Charles Roland, Jay A. Sollenberger, James Straw, Jr.

LOS ANGELES: Burton G. Adams, Fernando Alvarez, Everett W. Elgin, James E. Hodges, Ralph Humphreys, Rudolf Mastaler, James M. Routen, George W. Slomin, Donald D. Steel, Clare P. Ver West, William T. Wilson

LOUISVILLE: William F. Chapman

MELBOURNE: John K. Avery, Howard F. Chamberlain, W. Coker, D. D. Forbes, A. F. Fry, R. E. Gannon, C. D. Goebel, John P. Luttich, Francis P. McManamny, Edwin C. McNamara, C. S. B. Meaker, William Rodgers, Murray G. Sheppard

MILWAUKEE: J. C. Ashmead H. K. Hess, J. Monday, W. H. Timple, C. Winter

MONTREAL: G. L. Bayne, J. R. Deschenes, B. D. Russell, L. Sulvia

NEWARK: R. F. Fowler, A. A. Nortof, W. H. Ross, F. L. Scott, C. T. Smith, T. D. Wulff

PHILADELPHIA: L. S. Constantine, R. H. Elliott, Jr., E. J. Jankowsky

PORTLAND: T. O. Imhoff, D. S. O'Neill

PROVIDENCE-ATTLEBORO: E. H. Carpenter, J. Z. Dube, R. Harrison, A. R. Johnson, W. G. Johnson, E. P. Martin, L. J. Murphy, S. Nelson, T. E. Perkins, H. M. Smith, Jr.

ROCHESTER: L. Buraks, A. J. Cottrone, J. G. Hall, A. W. House, M. L. Kulp, C. H. Rosenbauer

ROCKFORD: L. F. Roth, L. M. Wadelton

ST. JOSEPH VALLEY: E. Adams, M. Condon, E. C. Darnell, J. Harter, R. H. Kindig, A. M. Oster

ST. LOUIS: P. W. Babby, W. W. Bishop, J. W. Busacca, R. W. Fournier, J. P. Hendrickson

SAN FRANCISCO: H. E. Anderson, P. B. Carter, Jr., E. G. Hanley, W. R. Perry, S. S. Truedell

SOUTHEASTERN: W. D. Buice, J. C. Lanius, J. G. Nickols

TOLEDO: J. A. Wagner

MEMBER-AT-LARGE: B. E. Bunce, Hounslow, England; V. J. Donnelly, Boksburg No, Transvaal, So. Africa; P. R. Kirwood, Staines, Middlesex, England; R. B. Lockett, Wanganui, New Zealand; F. H. Mitchell, No. Birmingham, England; J. W. Oswald, London, England; W. E. Piercy, London, England; K. Porter, Fort Worth, Texas; J. Rahola, Madrid, Spain; G. St. Pierre, Rimouski, Quebec, Canada; N. M. Sampat, Bombay, India; E. Sanchiz, Jr., Victoria, Spain; F. H. Scotland, Jamaica, British West Indies; D. G. Silcock, London, England; P. Squire, Staffs, England; W. W. Wheele, Surbiton, England; E. G. Win-

It's Good Business
and
It's Good Finishing
To Use

SEELEY BUFFING COMPOUNDS

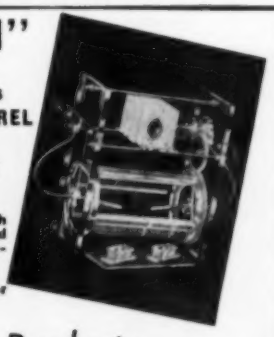
Bar — Liquid
Greaseless

E. E. SEELEY COMPANY, INC.
Buffing Compounds
Bridgeport 1, Conn.

BEAM-KNODEL CO.
Distributors for
HANSON-VAN WINKLE-MUNNING CO.'S
"PLATEMANSHIP"
A Complete Service for
ELECTROPLATING
POLISHING AND BUFFING
CLEANING AND ANODIZING
CA 6-3956-7 • 195 Lafayette Street, New York 12, N. Y.

USE READER SERVICE CARD; INDICATE A 869.

"LITTLE BUTCH"
the finest
High Temperature Plexiglas
PORTABLE PLATING BARREL
Make your small jobs profitable
Inside cylinder is 6 x 12 in. with 3/32 in. perforations. Gears and side are ⅞ in. thick and will withstand temperature of 180° F.
See your own supplier or write for catalog sheet



Starline Products
1717 NORTH MAIN ST., LOS ANGELES, CALIF.

AES Membership Report

grove, Bucks, England; C. M. Wong, Hong Kong, China

Reinstatements

BRIDGEPORT: W. Linn
DETROIT: C. L. Jones (returned from Armed Forces)
NEWARK: L. M. Brown, E. G. Walsh, Jr.
SAGINAW VALLEY: J. M. Small

Transfers

BALTIMORE-WASHINGTON: J. A. Cairns from Philadelphia; D. E. Couch from Los Angeles
CENTRAL MICHIGAN: C. DeGroat to Detroit; W. O. Dow, Jr., to Chicago
CHICAGO: K. C. Blin to Los Angeles; C. A. Crowley to Los Angeles; W. O. Dow, Jr., from Central Michigan; R. E. Parkinson to St. Joseph Valley; A. M. Weisberg from Providence-Attleboro
CLEVELAND: C. L. Fuelling from Philadelphia
DETROIT: D. Mason to Los Angeles
LOS ANGELES: K. C. Blin from Chicago; C. A. Crowley from Chicago; Walter B. Ellis from Houston; D. Mason from Detroit
NEWARK: C. T. Smith to Waterbury
PHILADELPHIA: C. L. Fuelling to Cleveland; F. W. Mountain to Pittsburgh
PITTSBURGH: M. F. Good from Member-at-Large; F. W. Mountain from Philadelphia
PROVIDENCE-ATTLEBORO: C. H. Layer from Toronto; A. M. Weisberg to Chicago
SPRINGFIELD: G. Hass to Bridgeport
WATERBURY: E. R. Jackson to New Haven

Resignations

BALTIMORE-WASHINGTON: T. J. Gressitt, C. A. Zapffe
BRIDGEPORT: H. W. June
CHICAGO: A. F. Castle, H. Hoenscheid, R. E. Lucht, L. B. Rosendahl
CINCINNATI: J. J. Bell
CLEVELAND: W. W. Hopkins, Jr.
DAYTON: R. F. Moore, R. Waymire
DETROIT: L. A. Darling
GRAND RAPIDS: E. S. Bradley, H. K. Fisk, F. Kueken
HARTFORD: L. Grabowski, J. N. Palantonio
LANCASTER: L. Neidigh
MELBOURNE: A. Port
MILWAUKEE: J. Anglim, A. Hocevar
NEWARK: C. Kuell, U. Mullins, J. Noyes
PROVIDENCE-ATTLEBORO: B. Barstow
ST. JOSEPH VALLEY: G. H. Horne
ST. LOUIS: A. G. Bignall
SPRINGFIELD: F. C. Rathbone
TOLEDO: R. Bechtel, A. Suckley
WATERBURY: W. G. Bendokas

Suspensions

CENTRAL MICHIGAN: H. T. Chadwick, L. B. Johnson, V. F. Scott
CINCINNATI: C. C. Claybaugh, C. H. Crutcher, J. R. Holaday, A. Schwering
CLEVELAND: L. Ensign
DAYTON: C. L. Austen
HARTFORD: J. H. Fairs
LANCASTER: R. E. Wiley, G. L. Wilt
MELBOURNE: A. E. Allen, W. L. Boyd, A. G. Burns, H. P. Cotter, A. F. Cummings, A. C. Isaacs, R. H. Keller, R. F. Kemp, F. Latta, R. W. Manderson, G. A. Noy, E. J. O'Toole, S. Patterson, J. L. Perdrix, J. N. Reeves, T. A. Robinson, K. W. Russell, A. T. Sharp, J. F. Tree, C. W. J. Young
PITTSBURGH: A. Hays, III
PORTLAND: V. Brandt, A. Jensen, G. Zeagus
PROVIDENCE-ATTLEBORO: M. Paulino
SOUTHEASTERN: James Bean, J. T. Hall, Jr., Olaf Olsen
SPRINGFIELD: R. T. Foley, J. L. Gagnon
WICHITA: R. H. Beatie, A. A. Melby

Deaths

HARTFORD: W. Lamie
MONTREAL: J. Feeley
NEWARK: T. Gardner, O. Zorrer
SAGINAW VALLEY: J. M. Gasper, B. L. Stuecher
TORONTO: C. A. Ward

"WATER AND WASTE CONTROL

For The Plating Shop" is an outstanding course-manual by a pioneer in the field, that will help you save time, money and materials. Easy to read, easy to follow, practical. An investment of $27.50 in this course may save you $1000 or more! Be prepared. Enroll today! Joseph B. Kushner Electroplating School, 115 Broad Street, Stroudsburg 1, Penna.

USE READER SERVICE CARD; INDICATE A 871.

FOR SALE

MODERN CONVEYORIZED WASHER BARGAINS!

TYPE OF CONVEYOR	STAGES	OPENING SIZE
TROLLEY	wash, rinse, dry	18" w, 24" h
MESH BELT	wash	30" w, 5" h
SLAT TYPE	wash	30" w, 18" h
TROLLEY	wash, rinse	48" w, 48" h

Also Automatic plating systems, rectifiers, motor generators, polishing machines, and heat treating equipment.
Arrangements can be made to rent, lease or sell on terms.

METAL TREATING EQUIPMENT EXCHANGE
9825 GREELEY, DETROIT 11, MICHIGAN
TOwnsend 8-8450—Please call "collect"

(Actual size)

TRUE BRITE
OXYPHEN
pH PAPERS

EASY TO USE—All you do is match the color of the indicator bar with the corresponding identified color bar.

Packed in plastic box (200 papers).

A range for every purpose.

No.	pH Range	Use
0318	0.3 to 1.8	Copper (acid)
2442	2.4 to 4.2	Bright Nickel
3045	3.0 to 4.5	" "
3954	3.9 to 5.4	" "
5267	5.2 to 6.7	Nickel (High pH)
96111	9.6 to 11.1	Brass
115140	11.5 to 14.0	Copper (cyanide)

Write for Bulletin No. 100 giving full details of 30 available ranges

TRUE BRITE CHEMICAL PRODUCTS CO.
BOX 31C OAKVILLE, CONN.

ILLCO-WAY

ionXchange

SOLVES A PROBLEM OF WASTE DISPOSAL...

The process of ionXchange offers the newest, simplest, and cheapest method of disposing of contaminated and weakened plating solutions. Instead of draining off such "waste" solutions, or treating them chemically where draining is impossible, ionXchange provides (a) recovery of most of the remaining plating acids for use in new make-up, (b) de-ionization of the contaminants so the effluent is clean and non-polluting, and (c) substantial savings in plating costs. *Practical* equipment is now available for treating chrome plating, anodizing, and other solutions.

TREATS RINSE WATER FOR RECOVERY AND RE-USE...

IonXchange also offers a method for treating rinse waters that accomplishes valuable improvements. Instead of running rinse water to drain in large quantities, ionXchange will (a) purify it completely so it can be recycled, (b) recover drag-out plating acids and make them available for new make-up of plating solution, and (c) reduce plating costs to a noticeable degree. Reprints of articles describing these operations, and pictures of successful installations, will be forwarded on request. Our representatives are available to consult on your specific needs.

ILLINOIS WATER TREATMENT CO.
840 CEDAR ST., ROCKFORD, ILLINOIS

ILLCO-WAY ionXchange

NEW YORK OFFICE: 141 E. 49TH ST., NEW YORK 17, N.Y.
CANADIAN DIST. PUMPS & SOFTENERS, LTD. LONDON, ONT.

Directory of AES Officers Branch Secretaries and Research Chairmen

AES OFFICERS

President.....CLYDE KELLY
American Plating Company
808 Keo Way, Des Moines, Iowa

First Vice-President.....DR. SAMUEL HEIMAN
Philadelphia Rust Proof Company
3227 Frankford Avenue, Philadelphia 34, Pa.

Second Vice-President.....FRANCIS T. EDDY
Technicraft Laboratories, Inc.
Thomaston-Waterbury Road, Thomaston, Conn.

Third Vice-President.....HERBERTH E. HEAD
Automotive Body Division
Chrysler Corporation
Detroit 31, Mich.

Past President.....DR RALPH A. SCHAEFER
Clevite Brush Development Company
Division of Clevite Corporation
540 E. 105th Street, Cleveland 8, Ohio

Executive Secretary.....P. PETER KOVATIS
445 Broad Street, Newark 2, N. J.

AES RESEARCH COMMITTEE

Chairman.....LESLIE C. BORCHERT
Houdaille-Hershey Corp., Detroit, Mich.

Secretary.....P. PETER KOVATIS
445 Broad Street, Newark 2, N. J.

ADELAIDE meets second Wednesday of each month at 7:30 P.M. at the University of Adelaide, North Terrace, Adelaide. Secretary-treasurer, R. J. Down, Room 30, 17 Currie Street, Adelaide, S. A., Australia.

ALLENTOWN-READING meets third Wednesday of each month at 7:00 P.M. in Scotty's Anchorage, Second and Main Streets, Emmaus, Pa. Secretary-treasurer, Edgar H. Iobst, Jr., 163 Main Street, Emmaus, Pa. Research finance committee chairman, Lee C. Wotring, 526 N. St. Elmo Street, Allentown, Pa.

BALTIMORE-WASHINGTON meets second Tuesday of each month with meetings in Baltimore at the Engineers' Club and in Washington, D. C., at the National Bureau of Standards. Secretary, Carl H. Thiede, 8426 Piney Branch Road, Silver Springs, Md.

BOSTON meets first Thursday of each month in Hotel Statler. Secretary, Dr. George P. Swift, 53 Galen Street, Watertown 72, Mass. Research finance committee chairman, Louis V. Gagnon, 53 High Street, Natick, Mass.

BRIDGEPORT meets second Friday of each month in Barnum Hotel. Secretary-treasurer, Robert G. Parker, 25 Beverly Road, Bridgeport 58, Conn.

BUFFALO meets first Friday of each month in Markeen Hotel. Secretary, E. G. Sampson, Jr., 43 W. Main Street, Falconer, N. Y. Treasurer, R. E. Campbell, 238 Sprague Street, Jamestown, N. Y. Research finance committee chairman to be appointed.

CAPITOL DISTRICT meets first Monday of each month at Panetta's Restaurant, Menands, N. Y., at 7 P.M. for dinner; educational session at 8 P.M. Secretary, Charles Schenk, 1765 Lenox Road, Schenectady, N. Y. Treasurer, John Green, R. D. 1, Thatcher Park Road, Voorheesville, N. Y. Research finance committee chairman, Chester J. Klimek, 16 Southern Avenue, Pittsfield, Mass.

AES Directory

CENTRAL MICHIGAN meets second Tuesday of each month at 7:00 P.M., alternating between Meadow Lark Inn in Jackson and Porter Hotel in Lansing. Secretary-treasurer, E. J. Bosca, 411 Third Street, Jackson, Mich. Research finance committee chairman, Dr. F. Gurnham, Dept. of Chemical Engineering, Michigan State College, E. Lansing, Mich.

CHICAGO meets second Friday of each month at 8 P.M. at Western Society of Engineers, 84 E. Randolph Street. Secretary-treasurer, Paul Glab, 882 N. Paulina Street, Chicago 22, Ill. Research finance committee chairman, Charles Geldzahler, c/o Platers' Technical Service, Inc., 509 S. Wabash Avenue, Chicago 9, Ill.

CINCINNATI meets fourth Wednesday of each month at 6:30 P.M. in Engineering Society Headquarters, East McMillan Street and Woodburn Avenue. Secretary, R. K. Evans, 8484 Wicklow, Cincinnati 36, Ohio. Treasurer, G. T. Speers, 1203 Fifth Avenue, Dayton, Ky. Research finance committee chairman, W. Wilson Loveless, 1350 Arlington Street, Cincinnati 25, Ohio.

CLEVELAND meets first Friday of each month in Hotel Carter at 8 P.M. Secretary-treasurer, R. I. Peters, 12901 Elmwood Avenue, Cleveland, Ohio.

COLUMBUS meets first Friday of each month at 8 P.M. in Battelle Memorial Institute Auditorium. Secretary, Michael Farr, 1735 Franklin Avenue, Columbus 5, Ohio. Research finance committee chairman, to be appointed.

DALLAS-FORT WORTH meets third Wednesday of each month at 6:30 P.M. in Lennox Hotel, Grand Prairie, Texas, half-way between Fort Worth and Dallas. Secretary-treasurer, research finance committee chairman, A. C. Fricke, 212 Julien Street, Dallas 3, Texas.

DAYTON meets third Wednesday of each month in the Biltmore. Secretary, Richard M. Clinchens, 33 W. Market Street, Germantown, Ohio. Research finance committee chairman to be appointed.

DETROIT meets first Friday of each month in Hotel Statler at 8 P.M. Secretary-treasurer, Edward J. Kubis, Wyandotte Chemicals Corp., Wyandotte, Mich. Research finance committee chairman, R. J. Racine, Wyandotte Chemicals Corp., Wyandotte, Mich.

GRAND RAPIDS meets second Friday of each month at Fingers Restaurant at 7 P.M. for dinner, educational session at 8:15 P.M. Secretary, Don Smith, 1825 Martin, Grand Rapids, Mich. Treasurer, P. Norton, 1119 Orchard, S. E., Grand Rapids, Mich. Research finance committee chairman, R. O. Watson, 3045 Kalamazoo, S. E., Grand Rapids, Mich.

HAMILTON meets third Thursday of each month in the Conference Room, West End Plant, Canadian Westinghouse Co., Ltd. Secretary, R. Burke, c/o Swift Devices, 14 George Street, Hamilton, Ontario, Canada. Research finance committee chairman, W. G. Finlay, 7 Hill Street, Hamilton, Ontario, Canada.

HARTFORD meets third Monday of each month in Hotel Bond, Hartford, Conn., at 7:45 P.M. Secretary, Stanley Platoz, 26 Erwin Place, New Britain, Conn. Treasurer, B. Cohen, 185 High Street, Willimantic, Conn. Research finance committee chairman, Frank Smith, Derby Milford Road, R. F. D. 1, Orange, Conn.

HOUSTON meets third Tuesday of each month at 7 P.M. in the Ben Milam Hotel, Houston, Texas. Secretary-treasurer, H. C. Van Wagner, c/o Barada & Page, 2812 Center Street, Houston, Texas. Research finance committee chairman, O. L. Smith, 2903 W. Dallas, Houston, Texas.

INDIANAPOLIS meets first Wednesday of each month at 8 P.M., at Fox Steak House, 1207 E. Washington Street. Secretary, Miss Edna Rohrabaugh, 415 N. 23rd Street, Lafayette, Ind.

JACKSON-LANSING: Name has been changed. See Central Michigan.

Listed below are some of the operations discussed in Oakite's 44-page handsomely illustrated booklet on Metal Cleaning. Please check the list. Then let us show you how Oakite methods can give you better production with greater economy.

Technical Service Representatives in Principal Cities of U. S. and Canada

SPECIALIZED INDUSTRIAL CLEANING

OAKITE

MATERIALS · METHODS · SERVICE

OAKITE PRODUCTS, INC.
40 Rector St., New York 6, N. Y.

Tell me about Oakite methods and materials for the following jobs:

- ☐ Tank cleaning
- ☐ Machine cleaning
- ☐ Electrocleaning
- ☐ Pickling, deoxidizing
- ☐ Pre-paint treatment
- ☐ Zinc phosphate coating
- ☐ Paint stripping
- ☐ Steam-detergent cleaning
- ☐ Barrel cleaning
- ☐ Burnishing
- ☐ Rust prevention
- ☐ ALSO send me a FREE copy of your booklet *"Some good things to know about Metal Cleaning"*.

Name _____

Company _____

Address _____

FREE! Handiest Buffing Helper Ever Offered!

American Buff Company's

NEW **SISAL BUFF SELECTOR**

Selects the right buff... the right speed... the right size... } *Quick as a wink!*

Here's the buffing man's best friend—a quick, convenient "know-it-all" that answers practically any buffing question. With a simple twist of the dial, you can instantly find the recommended types of Sisal Buffs for most common finishing jobs on Automotive Parts, Housewares, Appliances, Metal Furniture, etc. Selections are shown for automatic and semi-automatic machines, as well as hand buffing. On the back is a rapid Calculator for correct sizes and speeds. Get this handy 2-in-1 tool to help you get the right buff—every time!

FREE to Buff Users

... write for yours today!

"For the Job that's TOUGH, Use an AMERICAN BUFF"

American Buff Company

2414 S. La Salle Street • Chicago 16, Ill.

AES Directory

KANSAS CITY: Regular meeting date to be announced. Secretary, Olin K. Bock, Turco Products, Inc., 2112 Grand Avenue, Kansas City, Mo.

LANCASTER meets second Friday of each month at 8 P.M. September, December and April meetings are held at Hanover, York and Harrisburg, respectively; all other meetings at the Old Mill Inn, Lancaster, Pa. Secretary-treasurer, Harry A. Saylor, 40 N. Poplar Street, Elizabethtown, Pa. Research finance committee chairman, Harry Hovis, Lincoln Highway, W. Lancaster, Pa.

LOS ANGELES meets second Wednesday of each month at 7 P.M. in Rodger Young Auditorium. Secretary, G. Hetz, 152 Clagstand Drive, Puente, Calif. Research finance committee chairman, Tony Stabile, 417 E. 16th Street, Los Angeles 21, Calif.

LOUISVILLE meets third Thursday of each month at 6:30 P.M., in Kapfhammers Party House, 1506 S. Shelby Street, Louisville, Ky. Secretary-treasurer, Joseph G. Sterling, 6025 Peggy Drive, Louisville 13, Ky. Research finance committee chairman, R. G. Marshall, 3020 Talisman Road, Louisville 5, Ky.

MELBOURNE meets third Thursday of each month at 8 P.M. in Metallurgy Theatre, Melbourne Technical College, 124 Latrobe Street. Honorary secretary-treasurer, B. Reaburn, Park Road, Ringwood, Victoria, Australia.

MILWAUKEE meets first Friday of each month at 8 P.M. in the East Room, Hotel Ambassador. Secretary-treasurer, Clifford A. Peters, 4124 W. Southland Drive, Milwaukee, Wisc. Research finance committee chairman, Les Diveley, 2936 N. 84th Street, Milwaukee 11, Wisc.

MONTREAL meets first Tuesday of each month at 8:30 P.M. ie Mount Royal Hotel. Secretary, Jean Monette, 11700 Notrn Dame Street, E., Montreal, Canada. Research finance committee chairman, P. M. Coady, 216 Westminster Avenue, Montreal West, Montreal, Canada.

NEWARK meets third Friday of each month at 8 P.M. in Hotel Robert Treat. Secretary, Dr. D. G. Foulke, Hanson-Van Winkle-Munning Co., Matawan, N. J. Treasurer, George Wagner, Hy-Grade Electro Plating Co., 35 Fourth Street, Newark, N. J. Research finance committee chairman, John Gumm, 538 Forest St., Kearny, N. J.

NEW HAVEN meets second Tuesday of each month at Mason Laboratory, Yale University. Secretary-treasurer, B. J. Gaffney, 40 Filbert Street, Hamden 14, Conn. Research finance committee chairman, W. K. Murray, 48 Maple Avenue, Meriden, Conn.

NEW YORK meets second and fourth Fridays of each month at 8:30 P.M. in the Statler Hotel. Secretary-treasurer, George Schore, 833 Baldwin Drive, Westbury, L. I., N. Y. Research finance committee chairman, Milton Nadel, 41-15 50th Avenue, L. I., N. Y.

PHILADELPHIA meets fourth Friday of each month at the Engineers' Club, 1317 Spruce Street, Philadelphia, Pa., at 8 P.M. Secretary, I. Wm. Marcovitch, 1302 St. Vincent St., Philadelphia, Pa. Treasurer, Paul Mentzer, Sr., 7242 Bingham Street, Philadelphia 11, Pa. Research finance committee chairman, Herman P. Wright, 194 Atlantic Avenue, Trenton, N. J.

PITTSBURGH meets first Wednesday of each month at 8 P.M. in the Avalon Room of the Sheraton Hotel. Secretary, Irvin H. Schram, Jr., 4782 Delma Drive, Pittsburgh 27, Pa. Treasurer, W. F. Pizoli, 6833 Meade Street, Pittsburgh 8, Pa. Research finance committee chairman, Myron Ceresa, 207 Highland Road, Pittsburgh 35, Pa.

PORTLAND meets second Tuesday at 6:30 P.M. in Berg's Chalet. Secretary-treasurer and research finance committee chairman, K. B. Humphrey, 2750 N. W. 31st Avenue, Portland 10, Oregon.

AES Directory

PROVIDENCE-ATTLEBORO meets third Monday of each month at 8 P.M. in Providence Engineering Society Hall, 195 Angell St., Providence, R. I. Secretary, F. L. Sherman, 17 Hillsdale Drive, Cranston, R. I. Research finance committee chairman, P. B. Lonsbury, 78 North Ave., Attleboro, Mass.

ROCHESTER meets third Monday of each month at 8 P.M. at the 40 & 8 Club, 933 University Avenue. Secretary, Frederick Johnson, 21 Shire Oaks Drive, Pittsford, N. Y. Research finance committee chairman, Clarence Van Epps, 305 Hurstburne Road, Rochester 9, N. Y.

ROCKFORD meets second Monday of each month at 7 P.M. in the Faust Hotel. Secretary-treasurer, E. J. Budden, 122 Twelfth Street, Rockford, Ill. Research finance committee chairman, David Stockton, 1511 Warren Road, Rockford, Ill.

SAGINAW VALLEY meets at Zehnder, Frankenmuth, Mich., second Wednesday of each month, September through May, except February, at 7 P.M. Secretary-treasurer, Raymond E. Gittins, 215 N. Birney, Bay City, Mich.

ST. JOSEPH VALLEY meets first Wednesday of each month at 8 P.M. in Hotel Elkhart, Elkhart, Ind. Secretary-treasurer, Harold J. Wiesner, 1016 Osolo Road, Elkhart, Ind. Research finance committee chairman, Arthur G. Wiegand, 181 North Elkhart Avenue, Elkhart, Ind.

ST. LOUIS meets second Wednesday of each month at 6:30 P.M. at the York Hotel, 6th and Market, St. Louis, Mo. Secretary-treasurer, Ward W. Kelly, 7046 Deerpath Drive, St. Louis, Mo. Research committee finance chairman to be appointed.

SAN ANTONIO meets third Monday of each month at De-Winne's Belgium Inn, 3119 W. Commerce, San Antonio, Texas at 7 P.M. Secretary-treasurer, T. H. Collard, 442 Pilgrim Drive, San Antonio, Texas.

SAN FRANCISCO meets second Thursday of each month alternating between St. Julien Restaurant, 140 Battery Street, San Francisco, and El Curtola Restaurant, 510 17th Street, Oakland. Secretary, B. I. Trygstad, 1727 Oak Street, Redwood City, Calif. Treasurer, R. L. Hefner, 286 Martens Avenue, Mt. View, Calif.

SEATTLE-PUGET SOUND meets the third Tuesday of each month at 8 P.M. at the Stewart Hotel, Second and Stewart, Seattle, Wash. Secretary, Mrs. Helen Archibald, 17560 Tenth Avenue, N. W., Seattle, Wash. Treasurer, R. Becker, 558 First Avenue, So., Seattle, Wash.

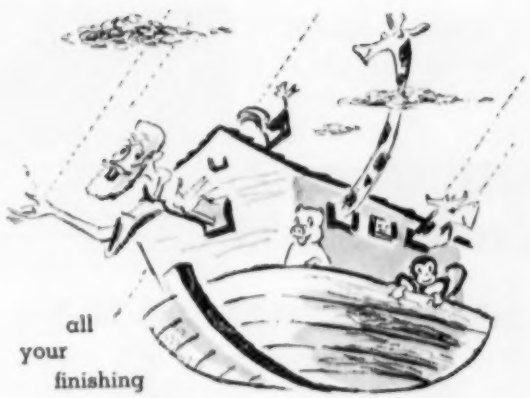
SOUTHEASTERN meets second Friday of each month at 7:30 P.M. at the Belmont Steak House, Atlanta, Ga. Secretary-treasurer, W. T. Weymouth, P. O. Box 246, Weaverville, N. C. Research finance committee chairman, C. H. Hohner, Udylite Corp., 1841 Cheshire-Bridge Road, N. E., Atlanta, Ga.

SOUTHERN TIER meets third Tuesday at 7:30 P.M. at the Ah-Wa-Ga Hotel, Owego, N. Y. Secretary, R. W. Wheeler, Austin F. Fletcher, Inc., Box 536, Binghamton, N. Y. Treasurer, M. Ihrie, 14 Pine View Terrace, Sydney, N. Y. Research finance committee chairman, E. Szymaniak, 118 Downs Ave., Johnson City, N. Y.

SPRINGFIELD meets fourth Monday of each month at 6:30 P.M. in Blakes Restaurant, 15 Market Street, Springfield, Mass. Secretary, Henry L. Heissfeld, 74 Chilson Street, Springfield, Mass. Treasurer, G. H. Mangeau, Hampton Ponds, Westfield, Mass. Research finance committee chairman, John E. Costigan, 74 Clairmont Place, Longmeadow, Mass.

SYDNEY meets second Thursday of each month at 7:30 P.M. at 155 King Street, Sydney. Secretary-treasurer, J. Lean, 63 Carranya Rd., Lane Cove, Sydney, Australia.

SYRACUSE meets third Monday of each month at 8 P.M. in Richard's Restaurant, 106 Ashdale Avenue, Syracuse, N. Y. Secretary, A. G. Martineau, Jr., 1024 Onondaga Avenue, Syracuse, N. Y. Treasurer, Allen A. Gutekunst, 224 Rich Street, Syracuse, N. Y. Research finance committee chairman, K. S. Parnell, 126 Wood Avenue, Syracuse, N. Y.



all your finishing needs **UNDER ONE ROOF**

J. Holland & Sons offers you the most comprehensive operation in the entire finishing industry. Because we maintain one of the world's largest in-stock supplies of polishing, plating and spray equipment, we can deliver in-stock merchandise immediately upon your request.

You can forget about the problems of buying your requirements from numerous sources. Get dependability, complete satisfaction and "one-stop" buying from under our large roof!

Our engineering and technical staff is ready to assist you in solving special problems. We'll be glad to help!

J. HOLLAND & SONS, INC.

leaders in finishing equipment for over half a century

475 KEAP ST. (corner Union Ave.) BROOKLYN 11, N. Y.

USE READER SERVICE CARD; INDICATE A 877.

Tamms

NEW!

Soft amorphous type

MICRO-SILICA

with these special features

OIL ABSORPTION (G & C)	36.4 to 40.3 LBS.
PH VALUE	5.0 to 5.2
MOISTURE	.5%

A NEW PROCESS SILICA

PARTICLE SIZE RANGE 1 TO 15 MICRONS

98% MINUS 10 MICRONS

New improved equipment assures highest quality and production control

WRITE TODAY FOR SAMPLES, PRICES AND SPECIFICATIONS

TAMMS INDUSTRIES, INC.,
228 N. La Salle St., Chicago 1, Ill.

A barrel load of bright nickel with a nickel's worth of

NICKELITE

CORROSION RESISTANCE UP 30 TO 100%

With Nickelite you can get 13 to 22 hours of salt spray exposure with 0.00006 inch of barrel nickel, instead of 11 to 13 hours. Actual salt spray tests show even greater improvement with thicker deposits. And you're saving money, too!

WRITE FOR FREE FOLDER ON MODERN BARREL PROCESSES

Platers Research Corporation

Concentrated to quadruple strength—you don't ship, store or handle water! Shipping weight cut 275%—no deposits, no carboy returns. Stable, efficient, easily stored, easily used—a capful of Nickelite is enough for a barrel load of nickel.

59 E. 4th ST. • NEW YORK 3

USE READER SERVICE CARD; INDICATE A 879.

NEW CORROSION-PROOF SURFACING FOR FLOORS

RESISTS ACID, ALKALIES, SOLVENTS
RESISTS ABRASION, IMPACT
COSTS LESS THAN ACID-PROOF BRICK
4 TIMES STRONGER THAN CONCRETE

COROCRETE

provides greater protection than conventional acid-proof floor materials . . . at considerable savings.

Recommended for use in chemical processing, food processing, plating and metal working industries, COROCRETE is quickly and easily applied over existing concrete surfaces . . . handles like cement topping.

Write today for trial sample of COROCRETE

THE CEILCOTE CO., Inc.

Corrosion-Proof Material and Construction

4842 Ridge Road • Cleveland 9, Ohio

USE READER SERVICE CARD; INDICATE A 880.

AES Directory

TOLEDO meets first Thursday of each month at Park Lane Hotel. Dinner at 6:30 P.M.; meeting at 8 P.M. Secretary-treasurer, Gaston Bergeman, 703 Pine Street, Fremont, Ohio.

TORONTO meets second Friday of each month in Royal York Hotel. Dinner 6:30 P.M.; meeting 8:30 P.M. Secretary-treasurer, E. F. Hutt, 15 Emily St., Toronto, Ontario. Research finance committee chairman, K. Wells, 370 Victoria Ave., Toronto, Ontario, Canada.

TWIN CITY meets first Monday of each month. October through June, in the Covered Wagon (Lodge Room), 114 S. 4th Street, Minneapolis, Minn., at 7 P.M. Secretary-treasurer, Robert L. Buckley, c/o Industrial Chemical and Equipment Co., 205 11th Avenue, So., Minneapolis 15, Minn. Research finance committee chairman, E. H. Lindemann, 1213 N. Leighton, Minneapolis 22, Minn.

WATERBURY meets second Thursday in September through May. Dinner 6 P.M.; business meeting 7 P.M. Technical meeting 8 P.M. Secretary-treasurer, Spencer L. Henn, 99 Ridgeview Place, Cheshire, Conn. Research finance committee chairman, Ellsworth T. Candee, Beach Avenue, Watertown, Conn.

WESTERN ONTARIO meets third Friday of each month at the Bungalo Inn, Lambeth, Ontario at 9 P.M. Secretary-treasurer, Dave Mainland, 21 Maple Street, Chatham, Ontario. Research finance committee chairman, Paul B. Croly, c/o Ontario Steel Products, Ltd., Chatham, Ontario.

WICHITA meeting place indefinite. Secretary, Frank Swift, 2041 North Mosley, Wichita 4, Kan. Treasurer, Leon Lawless, 1211 E. Douglas, Wichita, Kan.

FOR SALE
USED
PLATING EQUIPMENT

- 3 Hanson-Van Winkle-Munning Automatic Plating Machines
- 1 Udylite Automatic Plating Machine
- 3 6,000 Gallon rubber lined storage tanks 10′ x 8′ x 10′
- 1 Rubber lined tank 8′ x 3′ x 5′
- 3 Industrial Filter Pumps—8,000 gallon capacity
- 2 Titeflex Filters
- 2 Alsop Hi-Speed Filters
- 1 Phillips Degreaser
- 1 Blakeslee-Niagara Washing Machine
- 1 Blakeslee Drying Unit
- 1 Kreider—New Holland Centrifugal Dryer
- 2 Falls Industry Impervite Heat Exchangers, 7 tube standard, 9′ long
- Barrel Plating Equipment
- Hartzel, Sturtevant and Garden City Electrical Fans

Write—Wire—Phone

W. G. Smith, Stamping Division

EATON MANUFACTURING COMPANY

755 East 140th Street, Cleveland 10, Ohio

Telephone: GLenville 1-5600

USE READER SERVICE CARD; INDICATE A 881.

YOUR BEST BET

AMERICAN ELECTROPLATERS SOCIETY

RESEARCH PROGRAM

Is Your Company Keeping UP!

•

300 COMPANIES

THREE HUNDRED INDIVIDUAL companies are actively supporting the American Electroplaters' Society Research Program. These companies have found that the benefits, both direct and indirect they are deriving from their sustaining membership make it an extremely worthwhile investment.

Direct Benefits

Regular printed reports on developments of all research projects.

Indirect Benefits

Strengthening of the electroplating industry with greater knowledge and improved methods and processes through research.

If you are not already a Sustaining Member, send your check for $100.00 to the American Electroplaters' Society, 445 Broad Street, Newark 2, N. J.

AMERICAN ELECTROPLATERS SOCIETY

445 Broad St., Newark, N. J.

•

INVEST NOW
AES RESEARCH PROGRAM

Stop a Wildcat!
Extra Tough Hand Protection
PIONEER
Stanzoils
Milled neoprene makes tough Stanzoils stand extra hours contact with oils, acids, caustics and solvents. Milled neoprene has higher tensile, tear resistance than any other oil resistant rubber.
Super-Safe grip creates confidence, speeds work—handles wet slippery objects as if dry.
Only a liquid-tight glove gives positive physical protection from conditions that cause dermatitis.
32 PIONEER styles, weights, sizes and colors. Stanzoil catalog quickly shows how to pick best, most economical glove for each job. Write for it today!
N-54 heavy weight all neoprene 14" length. Curved fingers, Super-Safe grip.
The PIONEER Rubber Company
291 Tiffin Road • Willard, Ohio
STANZOIL
Quality Gloves for 35 Years

USE READER SERVICE CARD; INDICATE A 882.

Faster, Better Finishing with Harrison's New

4A

BUFFING AND POLISHING COMPOUNDS

You send us sample of metal used We will return finished sample together with compound for your specific requirements. Speed up productions with correct compositions.

HARRISON & COMPANY, INC.
HAVERHILL, MASSACHUSETTS

USE READER SERVICE CARD; INDICATE A 883.

Used by Platers, Silversmiths, Jewelry Manufacturers, Makers of Watches, Clocks and Electronics and other metal finishers.

Supplied in straight or crimped brass, steel or nickel silver wire in sizes .0025 to .006
Also available in Stainless Steel, Bristle, Fibre or Nylon
Special sizes and shapes to order.

Write (Dept. E) on your letterhead for catalog and price list.

DIXON & RIPPEL, INC. KINGSTON, N. Y.

USE READER SERVICE CARD; INDICATE A 884.

". . . destined to become the standard reference work in the water and waste disposal aspects of sanitary-engineering practice," says Edward J. Cleary, Ohio River Valley Water Sanitation Commission.

WATER SUPPLY and WASTE-WATER DISPOSAL

By G. M. FAIR, Harvard University; and J. C. GEYER, The Johns Hopkins University. Here is the first single volume to cover ALL the important principles. The work emphasizes the technology and scientific principles upon which the form and function of water and waste-water systems are built. Almost every chapter contains material that has never before appeared in a book on water and sewage. *1954. 973 pages. Illus.*

Members $13.00 **Non-members $15.00**

PLATING

445 Broad Street, Newark 2, New Jersey

PROTECT METAL PARTS BEFORE AND AFTER PLATING!

SWIFT RUST-RESISTING DIPS are available in a type for every application. Avoid RUST! Improve product appearance—eliminate costly rejects!

SWIFT RUST-RESISTING COMPOUNDS can often be used in place of more expensive organic coatings!

Send for literature.

Swift INDUSTRIAL CHEMICAL COMPANY CANTON CONNECTICUT

USE READER SERVICE CARD; INDICATE A 886.

★ IMPROVE YOUR PLATING

WITH PERIODIC-REVERSE UNITS

OF FINEST

QUALITY

UPA

WRITE FOR INFORMATION

UNIT PROCESS ASSEMBLIES, INC.

Mfrs. of Periodic-Reverse Units and Electronic Controls for the Plating Industry

75 East Fourth Street New York 3, N. Y.

USE READER SERVICE CARD; INDICATE A 887.

WATER

CLEAR • CLEAN

ALL METAL, LIFETIME, POSITIVE

POR-O-MET

FILTERS

Guaranteed to remove all filterables.

Filtering capacity renewed in 30 seconds by individual Reverse Flush feature.

IN USE BY MANY LEADING INDUSTRIAL FIRM

For Information write:

Por-O-met Company 1412 ALPS RD. PATERSON 2, N. J.

Zialite

Reg. U. S. Pat. Off.

for NICKEL PLATING

The one bath especially designed for plating DIRECTLY on ZINC, LEAD, ALUMINUM, BRASS, COPPER and IRON.

for HARD CHROMIUM

USE Zialite ADDITION AGENTS

Harder deposits. Increased throwing power. Less sensitivity to sulfate content. Exceptionally fine results plating anything calling for Decorative or Hard Chrome.

ZIALITE CORPORATION

92 Grove Street Worcester 5, Mass.

USE READER SERVICE CARD; INDICATE A 888.

FOR SALE

Complete—Like New—Immediate Delivery

G. E. ROLLER HEARTH 850 KW—1650 deg. F. 5' wide, 18" high, 35' long—80' cooling.
G. E. ROLLER HEARTH 465 KW—1650 deg. F. 5' wide, 18" high, 20' long—40' cooling.
G. E. PUSHER 240 KW—1650 deg. F. 4' wide, 24" high, 22' long—Quench Conveyor.
4000 CFH EXO GENERATOR with each above furnace.
YOUNG BROS. GAS RECIRC. CONVEYOR BELT—1000 deg. F. 6' wide, 24" high, 45' long. NEW.
UDYLITE DIPPING MACHINE, 1-12 Station Rotary Type.
UDYLITE 1-14 Station Rotary Zinc Plating Unit.
DRYING SYSTEM OVEN 450 deg. F.—13' W, 7' H, 64' L.
DRYING SYSTEM OVEN 150 deg. F.—10' W, 9' H, 52' L.
500 CFH Westinghouse Endothermic Generator.
SURF. COMB. GAS BOX 30" W, 18" H, 36" L. 1800 deg. F.
MARSHALL BLOW PIPE VENT HOOD.

PAPESCH & KOLSTAD, INC.

10707 Capital Ave., Oak Park (Detroit 37), Mich. Lincoln 11100

USE READER SERVICE CARD; INDICATE A 885.

USE READER SERVICE CARD; INDICATE A 889.

Index to Advertisers

A & P FINISHING & MFG. CO. 961
E. C. Watkins and Co.
ACME MANUFACTURING COMPANY, INC. 971
Agency—Rex Dye
ALLIED RESEARCH PRODUCTS, INC. 941
Emery Advertising Corp.
ALSOP ENGINEERING CORP. 944
AMERICAN BUFF COMPANY 1064
Burlingame-Grossman
AMERICAN INSTRUMENTS, INC. 1052
Frederic G. Rottmund
AMERICAN PLATINUM WORKS 959
Stuart Sande Advertising Agency
ANALYTICAL MEASUREMENTS, INC. 1056
APOTHECARIES HALL COMPANY 973
Edward Owen & Company
BAKER & ADAMSON PRODUCTS, GENERAL CHEMICAL DIV., ALLIED CHEMICAL & DYE CORPORATION 953
Atherton & Currier, Inc.
M. E. BAKER COMPANY 983
BART-MESSING CORPORATION 956
Bass and Company
BEAM-KNODEL COMPANY 1061
BELKE MANUFACTURING CO. 969
Allbright Associates
BETTER FINISHES & COATINGS, INC. 946
James J. McMahon, Inc.
CEILCOTE COMPANY 1066
Penn and Hamaker Advertising
CHANDEYSSON ELECTRIC COMPANY 989
Oakleigh R. French & Associates
THE CHEMICAL CORPORATION 996
Wm. B. Remington
CHEMSTEEL CONSTRUCTION CO., INC. 1053
Smith, Taylor & Jenkins Inc.
CHASE BUFF CO. 1070
CLEVELAND PROCESS COMPANY 976
Malcolm Advertising Agency
COCHRANE CORP. 947
Hening & Company
DIAMOND ALKALI COMPANY 1050
Fuller, Smith & Ross
DIXON & RIPPEL, INC. 1067
DUGGAN MASKING DEVICES 1070
A. R. Brash & Sons
EATON MFG. CO. 1066
Clark & Bobertz, Inc.
ELGIN SOFTENER CORP. 1070
Kreicker & Meloan, Inc.
ENTHONE, INCORPORATED 931
Hugh H. Graham & Associates
THE EXOLON COMPANY 936
Melvin F. Hall Advertising Agency
FEDERATED METALS DIVISION, AMERICAN SMELTING & REFINING COMPANY 1058
John Mather Lupton Company, Inc.
FORMAX MANUFACTURING COMPANY 950
Brindley-Roth, Inc.
GRAVER WATER CONDITIONING CO. 985
Trade Methods Advertising
GREEN ELECTRIC COMPANY 991
Shappe-Wilkes, Incorporated
FREDERICK GUMM CHEMICAL CO. 2nd Cover
Schniedenbach Studios
HANSON-VAN WINKLE-MUNNING COMPANY 963, 964, 965, 966
O. S. Tyson & Company, Inc.
HARRISON & COMPANY 1067
THE HARSHAW CHEMICAL COMPANY 934
J. HOLLAND & SONS, INC. 1065
Norman D. Waters & Associates
R. O. HULL & COMPANY, INC. 960
Ralph M. French Advertisers
ILLINOIS WATER TREATMENT CO. 1062
Cummings, Brand & McPherson
INDUSTRIAL FILTER & PUMP MANUFACTURING CO. 942
Merrill, McEnroe & Associates, Inc.
INFILCO, INC. 1057
Willard G. Gregory & Co.
KOCOUR COMPANY 1054
DeCamerera & Associates
KOPPERS COMPANY, INC. 962
Batten, Barton, Durstine & Osborn
JOSEPH B. KUSHNER 1060
LASALCO, INCORPORATED 945
Charles W. Bolan Advertising
THE LEA MANUFACTURING CO. 1037, Back Cover
Sanger-Funnell, Inc.
LEA-RONAL, INC. 1038
CHARLES F. L'HOMMEDIEU & SONS 958
L. A. WATER SOFTENER COMPANY, INC. 952
Edw. J. Cort Co.
MacDERMID, INC. 3rd Cover
Jackson-Hall Company
THE McGEAN CHEMICAL COMPANY 937
THE MEAKER COMPANY 954
Armstrong Advertising Agency
METAL TREATING EQUIPMENT EXCHANGE 1060
Powell-Gayek Advertising
MICHIGAN BUFF COMPANY, INC. 1053
MICHIGAN CHROME & CHEMICAL CO. 939
Karl G. Behr Advertising Agency
MUTUAL CHEMICAL CO. OF AMERICA 993
The House of J. Hayden Twiss
NATIONAL ALUMINATE CORP. 979
Armstrong Advertising Agency
NEW HOLLAND MACHINE COMPANY 970
J. Walter Thompson Company
NOBLES ENGINEERING MFG. COMPANY 1000
E. W. Sann & Associates
NORTHWEST CHEMICAL COMPANY, INC. 997
F. B. Hubert Advertising Counsel
OAKITE PRODUCTS, INCORPORATED 1063
Rickard and Company
PAPESCH AND KOLSTAD, INC. 1068
PERMUTIT COMPANY 987
Cunningham and Walsh, Inc.
THE PIONEER RUBBER COMPANY 1067
Carr Liggett Advertising, Inc.
PLATERS RESEARCH CORPORATION 1066
Louis Glassner & Associates
POR-O-MET 1068
POWERS REGULATOR COMPANY 955
Symonds, MacKenzie & Company
PROMAT DIV., POOR AND COMPANY 938
Russell T. Gray, Inc.
PYROSIL, INC. 1053
Koehl, Landis and Landau, Inc.
RICHARDSON-ALLEN CORPORATION 998
Claude Schaffner Advertising Agency
SCHAFFNER MANUFACTURING CO., INC. 982
Advance Advertising Company
E. E. SEELEY COMPANY, INC. 1061
SELLERS ENGINEERING COMPANY 994
McCarty Company
SEL-REX PRECIOUS METALS, INC. 977
Bass and Co., Inc.
SETHCO MANUFACTURING COMPANY 972
Harry Hurst Advertising
THE SEYMOUR MFG. COMPANY 984
Claude Schaffner Advertising
SPARKLER MANUFACTURING CO. 975
Kreicker & Meloan, Inc.
STARLINE PRODUCTS 1061
FREDERIC B. STEVENS, INC. 932, 983
Zarker Advertising Company
STORTS WELDING COMPANY, INC. 943
Harold S. Card
GEORGE A. STUTZ MFG. COMPANY 986
Sander Rodkin Advertising Agency
SULPHUR PRODUCTS, CO., INC. 1054
SWIFT INDUSTRIAL CHEMICAL COMPANY 1068
K. C. Shenton Advertising Service
TAMMS INDUSTRIES, INC. 1065
The Macrowan Advertising
TRUE BRITE CHEMICAL PRODUCTS COMPANY 1060
THE UDYLITE CORPORATION 980, 981
Zarker Advertising Company
UNIT PROCESS ASSEMBLIES, INC. 1068
Glassner & Associates
UNITED CHROMIUM, INC. 978, 995
Rickard & Company
U. S. STONEWARE 949
Ralph Gross Advertising, Inc.
WAGNER BROTHERS, INC. 1001, 1002, 1003, 1004
Fred P. Bingham Tech. Adv.
WALLACE & TIERNAN COMPANY, INC. 999
H. H. Brantstater Associates
WESTINGHOUSE ELECTRIC CORP. 990
Fuller & Smith & Ross
WYANDOTTE CHEMICALS CORPORATION 951
Brooke, Smith, French, and Dorrance
ZIALITE CORPORATION 1068

For Metal Finishers!

Pressure Moulded NEOPRENE **"CAPLUGS"**

7 STANDARD SIZES

	A	B	C	D	E	F	G
TO PLUG HOLE SIZE	1/8-3/16	3/16-1/4	1/4-5/16	5/16-1/2	1/2-5/8	9/16-11/16	5/8-3/4
TO CAP STUD SIZE	3/32-5/32	5/32-3/16	3/16-1/4	1/4-5/16	3/16-3/8	3/8-7/16	5/16-1/2

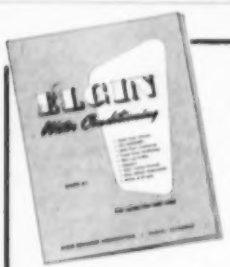
MASKING PROBLEMS OUR SPECIALTY!

WRITE FOR **FREE** SAMPLE KIT...

DUGGAN Masking Devices

2030 WEST FORT STREET
DETROIT 16, MICHIGAN

USE READER SERVICE CARD; INDICATE A 890.



GET THIS HELPFUL 20-PAGE BOOK No. 611B

COVERS LATEST DEVELOPMENTS IN

ION EXCHANGE

WATER SOFTENER EQUIPMENT
DEIONIZERS • DEALKALIZERS
OTHER WATER CONDITIONING EQUIPMENT

This 20-page book which describes today's newest types of water conditioning equipment will be of real interest to you. It covers water softeners, deionizers, dealkalizers, filters, other water conditioning equipment, and water treating chemicals —all designed to increase production and cut costs.

Write for Your Copy Today!

(If desired, we will have our nearest representative get in touch with you)

ELGIN SOFTENER CORP.
Dept. P Elgin, Illinois

Future Meetings

INTERSOCIETY

August 22-23—Stanford Research Institute and National Industrial Conference Board, Sheraton-Palace, San Francisco, Calif.

September 6-17—National Machine Tool Builders' Association, International Amphitheatre, Chicago, Ill.

September 6-17—Production Engineering Show to be held in conjunction with the Machine Tool Show, Navy Pier, Chicago, Ill.

September 6-17—Coliseum Machinery Show (formerly Metalworking Machinery & Equipment Exposition), Chicago Coliseum, Chicago, Ill.

September 8- 9—Chemical Institute of Canada, Physical Chemistry Division Conference, Montreal, Canada.

September 11-16—American Chemical Society, National Meeting, Minneapolis, Minn.

September 12-16—Illuminating Engineering Society, National Technical Conference, Cleveland, Ohio.

September 12-16—Instrument Society of America, 10th Annual Instrument Conference and Exhibit, Shrine Exposition Hall and Auditorium, Los Angeles, Calif.

September 14-16—Porcelain Enamel Institute, 17th Annual Shop Practice Forum, Ohio State University, Columbus, Ohio.

September 19-22—American Institute of Mining and Metallurgical Engineers, Industrial Minerals Division, Asheville, N. C.

September 25-28—American Institute of Chemical Engineering, Regional Meeting, Lake Placid Club, Lake Placid, N. Y.

AES

September 16—Plating Editorial Board, Hotel Statler, Washington, D. C.

September 23—AES Research Committee, AES Headquarters, 445 Broad St., Newark, N. J.

June 17-21, 1956—43rd Annual Convention of the American Electroplaters' Society, Hotel Statler, Washington, D. C.

June 17-20, 1957—44th Annual Convention of the American Electroplaters' Society, Sheridan-Mt. Royal Hotel, Montreal, Canada

May 19-22, 1958—45th Annual Convention of the American Electroplaters' Society, Sheraton-Gibson Hotel, Cincinnati, Ohio.

June 14-18, 1959—46th Annual Convention of the American Electroplaters' Society and 5th Industrial Finishing Exposition, Detroit, Michigan; and 5th International Conference on Electrodeposition.

Complete Line of SISAL BUFFS

BIAS-CONVENTIONAL AND BIAS METAL CENTER IN 5" AND 7" CENTERS

"As Good As Any—Better Than Most"

Chase **BUFF CO.**

3506 HEATHCOTE AVE., NEW YORK 69
Telephone FAirbanks 4-7570

ATTENTION JOBBERS: We have choice territories available. Call or write today.

Try THESE CLEANERS *Now*
for Guaranteed Results!

Anodex
for Electrolytic Cleaning

The original ANODEX Reverse Current CLEANING PROCESS is now available in many special variations to meet any requirements for electrolytic cleaning of ferrous metals.

Using ANODEX, all types of soil including inert type carbon can be removed in a matter of seconds.

Write today for a guaranteed production trial.

Metex T103
for Soak Cleaning

An entirely new type of soak cleaner that contains an improved, different type of emulsifier which removes oil and other contaminants much faster than soaps or wetting agent type materials . . . METEX T103 rinses readily — even in cold water — and oils are emulsified into the main body of the cleaning solution and do not dragout on the work being processed.

Write for full information and ask the MacDermid Technical Service Engineer who calls on you for a trial demonstration.

Write
FOR FREE DATA SHEETS

MAC DERMID
Incorporated
WATERBURY 20, CONNECTICUT

FOR 33 YEARS *Originators* FOR THE METAL FINISHING INDUSTRY

USE READER SERVICE CARD; INDICATE 808

LEA COMPOUND

...the start of a leading world-wide business in Surface Finishing Service and Supplies

In the early twenties some revolutionary thinking, tied in with the trade name LEA, sparked major changes in both methods of and materials for polishing and buffing. The basic idea was that surface finishing need not be messy . . . that such operations could and should be clean. Revolving initially around Lea Compound, the first greaseless abrasive composition made available to industry, and later around other LEA compositions of comparable quality, new abrasive finishing procedures resulted in either better finishes, lower cost finishing, or both.

Yes, Lea Compound surely did revolutionize both finishing methods and materials!

Today, Lea Compound is used all over the world and is available in many kinds and grades of abrasives. It is complemented by LEAROK, the bright finishing bar with "no-free-grease"... by LEA Liquabrade, industry's noted liquid abrasive . . . and a host of buffing and polishing specialties. LEA methods are now used by many of the largest plants with finishing production lines.

The salient point to remember when you deal with LEA — for both service and supplies — is that you are dealing with long established and thoroughly experienced Surface Finishing Specialists.

LEA COMPOUND and its family of FINISHING SPECIALTIES

LEAROK . . . industry's "no-free-grease" buffing composition.

LEA LIQUABRADE . . . safe, uniform, stable spray finishing liquid composition ideal for production line work.

LEABRAMENT . . . quick drying, liquid spray abrasive for burring, polishing or satin finishing.

AD-LEA-SIVE . . . glue base adhesive for sizing flexible polishing wheels.

LEA GRIPMASTER . . . polishing wheel cement.

LEA LIQUALUBE . . . water soluble polishing wheel and belt lubricant.

LEATARDENT . . . stain and tarnish preventive for plated surfaces.

LEA KROMSAVERS . . . mist loss preventive for plating solutions.

LEA LAPPING PASTE . . . micron size controlled abrasive paste for fine surface finishing.

plus

Superior Plating Solution Addition Agents for copper, nickel, cadmium, gold, silver, brass, etc. . . . developed by Lea-Ronal, Inc.

Burring, Buffing, Polishing, Lapping, Plating and Spray Finishing . . . Manufacturers and Specialists in the Development of Production Methods, Equipment and Compositions. Manufacturers of Lea Compound and Learok . . . Industry's quality buffing and polishing compounds for over 30 years.

THE LEA MANUFACTURING CO.
16 CHERRY AVE., WATERBURY 20, CONN.

Lea-Michigan, Inc., 14066 Stansbury Ave., Detroit 27, Mich.
Lea Mfg. Company of Canada, Ltd., 370 Victoria St., Toronto 2, Canada
Lea-Ronal, Inc., Main Office and Laboratory: 42-48 27th St., L.I.C. 1, N.Y.
Manufacturing Plant: 237 East Aurora St., Waterbury 20, Conn.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 899.